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Contents, Page 23

Vol. 20. No. 1 JANUARY, 1922

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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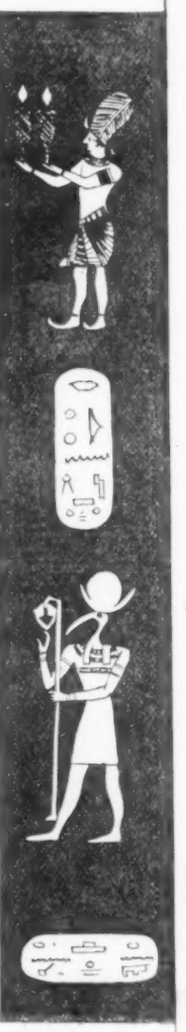

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THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW.

Vol. 20 NEW YORK, JANUARY, 1922 No. 1

Elektron Metal

A New Alloy of Magnesium

Written for The Metal Industry by ADOLPH BREGMAN, Managing Editor

Elektron metal was first produced commercially in 1912; by 1914 it was being turned out on a large scale by the Chemische Fabrik Griesheim Elektron, Frankfurt-am-Main, Germany. Before the war this company was the sole producer of magnesium in large quantities in the world. At the present time it is still the largest by a wide margin. Several concerns in the United States have undertaken the manufacture of magnesium alloys, but the manufacture of the metal itself, commercially, is barely out of the experimental stage, except for the output of the German manufacturers, who are at present the sole producers of the metal at low cost. The American agents for the C. F. G. E. are A. P. & S. Rippenbein, New York. Among other manufacturers of magnesium alloys in this country are American Magnesium Corporation, Niagara Falls, N. Y.; Dow Chemical Company, Midland, Michigan; Magna Metal Corporation, New York; M. W. Metal Company, New York.

An idea of the extent of the use of elektron metal in Germany can be gained from the fact that during the war shavings from the fuse industry were send back to the manufacturers at the rate of about 132,300 pounds per month. This is equal in volume to 640,000 pounds of brass.

TYPES AND FORMS OF ALLOYS MANUFACTURED

Elektron metal is turned out in the following classifications:

1. Alloy "C M" for electrical conduction purposes.
2. Alloy "Z I" for machining and mechanical working.
3. Alloy "A Z M" for such purposes where a specially high degree of hardness is necessary.
4. Alloy "A Z" for casting.

It is manufactured and fabricated into sheets, rods, tubes, wire, slabs, pressed shapes, extruded shapes, castings, blocks and ingots.

PHYSICAL CHARACTERISTICS

The outstanding feature of all these alloys is their extremely light weight. They have a specific gravity varying from 1.74 to 1.84, which is all the more startling when it is remembered that aluminum has a specific gravity of about 2.6.

TABLE OF PHYSICAL CHARACTERISTICS

	Alloy CM	Alloy ZI	Alloy AZM
Electrical Conductivity...	21.5-22.5	16-18	12-13
Temperature Co-efficient.	0.0038	.....	.....
Heat Conductivity	0.38	0.32	.....
Expansion Co-efficient ...	0.000027	.....	.....
Specific Heat	0.25	0.24	0.24
Melting Point	650 deg. C.	635 deg. C.	630 deg. C.
Specific Gravity	1.74	1.83	1.84

(The electrical conductivity in above is given in reciprocal ohms per CCM, copper for instance is 56, aluminum 33, at 20 deg. Cent. The temperature co-efficient is .0038 for 1 deg. C.)

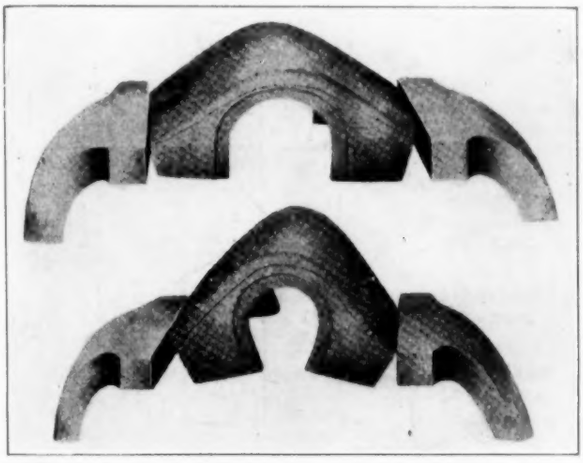


FIG. 1—BENDING ELEKTRON CASTINGS.

(Alloy AZ, the casting alloy, is similar in many respects to Alloy ZI in its essentials it has the characteristics of this alloy, ZI, but has a higher degree of pliability (3 to 4%)).

In appearance elektron metal is similar to aluminum, but with a more silvery color and without the blue tint. It can be polished. It has in addition the peculiar

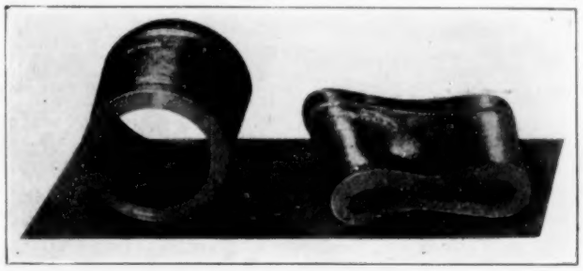


FIG. 2. FLATTENED CASTING.

quality of pliability when cast, which makes for much less danger of splitting and cracking. Figure 1 shows a casting bent in a vise, and Figure 2 shows another casting hammered almost flat.

As regards its strength, the following table gives data, which so far has been collected and made available for publication. It is stated that tests have been made by American laboratories checking these results very closely. The Bureau of Construction and Repair of the Navy Department, Washington, D. C., also made tests on scleroscope hardness, ductility, yield point, tensile strength and elongation, which ran somewhat above the figures given in the table for purpose of comparison. An instance is given which is interesting: If it were desired to replace a steel beam by one of elektron metal it would be necessary to increase the cross-sectional area by 50 per cent to maintain the same strength, and even then the elektron metal beam would weigh only 35 per cent of what the steel beam weighs.

PHYSICAL CHARACTERISTICS OF ELEKTRON METAL.

FORMS	ALLOYS	PROPORTIONAL LIMITS	ELASTIC LIMITS	BREAKING POINT TENSILE STRENGTH RESISTANCE	ELONGATION	CROSS-SECTION CONTRACTION	MODULUS OF ELASTICITY	HARDNESS BRINELL	SHORE (degree)	NICKING TENACITY	SHEARING STRENGTH
		M lb sq in	M lb sq in	M lb sq in	%	%	M lb sq in	M lb sq in		M lb sq in	M lb sq in
CAST	(CM	-----	-----	17-20	5-6	-----	-----	-----	9-11	-----	-----
	(ZI	7	11-16	17-21	1.5-3	1-3	-----	-----	12-14	-----	-----
	(AZM	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
PRESSED	(CM	-----	11-18	26-31	20	14	5800	-----	-----	-----	-----
	(ZI	9-10	21-26	37-40	18-22	24	6200	80	14-20	6-7	21
	(AZM	-----	26-28	41-44	12-14	10-12	-----	-----	-----	-----	-----
PRESSED & HARDENED BY HAMMERING.	(CM	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
	(ZI	-----	-----	55-64	1-2	-----	-----	-----	25-28	-----	-----
	(AZM	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
ROLLED (sheets) Hard	(CM	-----	-----	28-31	3-5	-----	-----	-----	20	-----	-----
	(ZI	-----	-----	41-45	2-3	-----	-----	-----	22-23	-----	-----
	(AZM	-----	-----	48-55	2-4	15-20	-----	-----	-----	-----	-----
ROLLED (sheets) Soft (hot)	(CM	-----	-----	21-24	11-15	-----	-----	-----	12.5	-----	-----
	(ZI	-----	-----	27-33	8-12	-----	-----	-----	14	-----	-----
	(AZM	-----	-----	40-43	15	-----	-----	-----	-----	-----	-----
DRAWN (wire) Hard	(CM	-----	-----	31-33	2-5	-----	-----	-----	-----	-----	-----
	(ZI	-----	-----	44-48	6-10	-----	-----	-----	-----	-----	-----
	(AZM	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
DRAWN (wire) soft (hot)	(CM	-----	-----	25.5	9-12	13	-----	-----	-----	-----	-----
	(ZI	-----	-----	37-40	18-20	-----	-----	-----	-----	-----	-----
	(AZM	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

For protection against chemicals it is recommended that the metal be coated with a protective paint, lacquer or enamel and the one recommended most highly is a special bakelite varnish which, it is stated, protects the metal from acids.

One important point to consider in the use of elektron metal is the danger of combustion. Facts concerning this condition are given as follows:

1. Ignition can occur only when the metal is heated beyond its melting point.

2. Continued burning is possible only with a piece of very thin cross-section such as a ribbon. The fact that elektron metal is used for trolley loops and generator brush holders seems to indicate that this danger is either not great or can be easily controlled.

An interesting test at the Airdome Adlershof is cited in which a motor casing of elektron was built into an old aeroplane in place of the motor and then the filled gasoline tanks set afire. In a moment the whole aeroplane was ablaze. After the wood was completely consumed it was noted that parts of the cast pieces out of the side of the motor were falling to the ground without burning at all; the body then caved in upon the casing and it burned, but only with a quiet flame. It was stated that elektron metal was the last inflammable material to catch fire.

One real difficulty is the handling of chippings and shavings, because of their small cross-section. These should be kept carefully and not allowed to scatter throughout the shop. No accumulation of shavings should be permitted and the benches should be kept clean to avoid corrosion. An iron box under the machine can be used to keep the shavings in. An important precaution is that if a fire should occur, it must be extinguished with dry sand or a mixture of two parts of burned magnesia and one part of a heavy non-inflammable oil. WATER SHOULD NEVER BE USED.

CHEMICAL CHARACTERISTICS

Elektron metal is peculiar in that it is not affected by alkaline fluids, nor is it attacked by gasoline, benzine or oils and fats free from acid. It will take numerous coats, finishes, etc., and can be colored to imitate brass and copper. It is, however, susceptible to attack by all acids (including weak organic acids), except pure and not too strongly diluted hydrofluoric acid. It will not stand against salt solutions or chlorides and sulphates of heavy metals and ammonia. It is, therefore, not adapted for continuous contact with moisture. However, it resists weather and atmospheric deposits by coating itself with gray oxide skin which protects it from further oxidation. It is claimed that even in moist air elektron metal stands up better than iron, because the oxide clings to the metal very closely, while rust on iron loosens, exposing fresh surfaces.

The analysis of a typical rod (probably extruded—see THE METAL INDUSTRY, November 1921, Page 433), is Mg-95, Zu-4.5, Cu-.5.

ELECTRICAL CHARACTERISTICS

Elektron metal is electro-positive to iron. Its electrical potential is about .85, which compares with iron .34, zinc .77, aluminum 1.22. The conductivity varies from 12 to 22 ohms per cubic centimeter. This compares with copper 56, aluminum 33. The alloy CM, which is especially recommended for electrical conduction work, has an electrical conductivity of about 70 per cent of aluminum. Therefore the weight of an electrical conductor for a certain strength of current is 95 per cent of the weight of an aluminum conductor to carry the same current. By weight 55 per

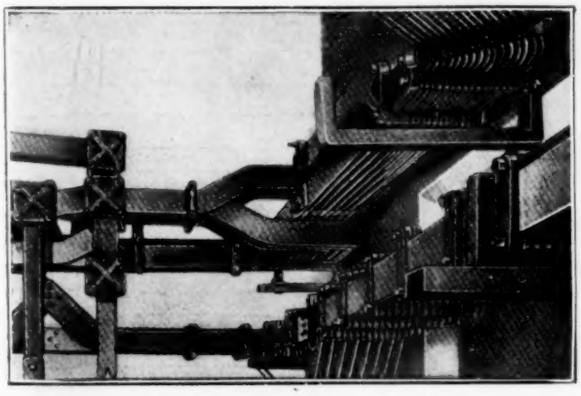


FIG. 3. ELECTRICAL INSTALLATION.

cent of elektron will carry as much as copper. Figure 3 shows an installation of elektron metal for current carrying.

FABRICATION, WORKING, ETC.

Elektron metal is made in various shapes by casting, rolling, drawing, extruding, stamping and hot pressing. It is malleable between 220 degrees and 250 degrees centigrade. It is recommended that the stamping be done at the higher ranges.

Metal which has become brittle by treatment can be annealed by heating from 15 minutes to two hours at 350 to 400 degrees centigrade. As previously mentioned castings can be bent. Sheets will not take a right-angle bend at ordinary temperatures, but will at 300 to 350 degrees centigrade.

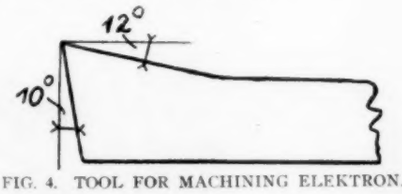


FIG. 4. TOOL FOR MACHINING ELEKTRON.

For machining, a tool with a 12-degree face and a 10-degree rake (see Figure 4) is recommended, with a turning speed from 328 to 492 feet per minute. The machining should be done dry, with no grease or other lubricant. The tool must be kept sharp. It is claimed that elektron metal is not in the slightest degree subject to splitting, cracking or splintering, and that it can be machined in less than one-half the time necessary to machine aluminum, brass, bronze or iron.

SOLDERING AND WELDING

The soldering of elektron metal is so far in the same stage as the soldering of aluminum, that is, that no trustworthy certain solder has been developed. Welding, however, has been done either by the autogenous or the forge method. The autogenous welding is done with the oxy-hydrogen flame. Thin sections can be welded, but no more easily or better than other metals.

The general practice is to weld it like aluminum, but to use a special welding powder, "Autogal," made by the C. F. G. E electric point or spot welding has not yet been developed.

MELTING AND CASTING

The instructions from the manufacturer for sand casting state that the molding sand should be selected on the basis of the following classifications:

1. High silica content to allow great permeability and low contraction.
2. It must be plastic, but with no more clay than is absolutely necessary for binding.
3. It must be free of materials which change their chemical and physical properties with higher temperatures (with the exception of mechanically included water).

The core sand must be even more porous and easily removable from the casting. Sawdust or charcoal dust can be used for increasing this porosity, making it looser.

It must be remembered that elektron metal when melted is sluggish and oxidizes very easily. Impurities, air or gas bubbles, etc., must not be permitted to get into the melt, and therefore narrow or wedge-shaped gates are used. For large pieces, instead of using larger gates, the practice is to use a greater number of the smaller gates. The molds should be designed so that the thinnest sections of the casting are the first to be filled. The shrinkage of alloy AZ for casting is about 1.1 per cent.

The molds and cores must be carefully dried before using, as no moisture is permitted to come in contact with the liquid metal. It is, therefore, impossible to cast in green sand, and the molds and cores must be dried for at least three hours at 450 degrees C. This is necessarily a careful operation in which the temperature is regulated by a pyrometer. Sand which is not completely dried will produce dull gray castings. Wet spots which may be due to repairing the molds after drying cause bubbles. If a specially smooth surface is desired the molds and cores can be blacked with plumbago before they are dried.

The design of the mold should take into consideration the fact that the metal has a high viscosity and a low specific gravity and that impurities rise to the top only with difficulty. If the metal has been overheated skins and lumps of oxides and nitrides are formed and retained in the mold. It is, therefore, desirable to use pressure at the place of the largest cross-section. A glance at Figure 5 will show the method of gating piano frames. The metal is poured

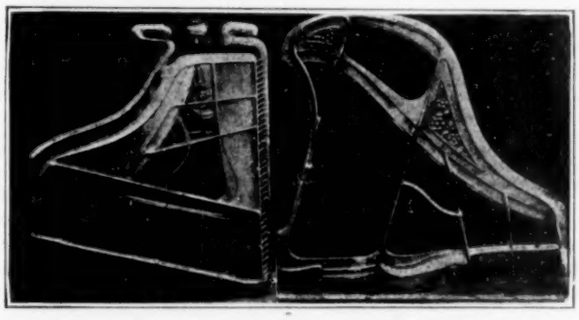


FIG. 5. PIANO FRAME. NOTE THE NUMEROUS GATES.

into the main runner from which many narrow off-shoote are taken into the casting itself.

As regards the drying of the molds, Figure 6 shows a detail of the type of furnace used. The molds are placed in chamber A during the afternoon. Door D is closed and in fireplace C a wood or charcoal fire is built. The heated gases of combustion pass through the draft D, into the chamber, out through the draft E, into the chimney and out into the open air. Inside of two hours the temperature is increased to 450 degrees C. and kept at that level for three hours. The fire is allowed to cool gradually until after nine hours the temperature drops to 200 degrees C. This reduction of temperature can, however, be speeded somewhat. Before beginning a new firing process the chamber is opened and after half an hour or one hour the molds can be removed. The coke consumption for the furnace shown in Figure 6 is between 300 to 400 kilograms per heat (660 to 880 pounds).

The metal is melted in iron crucibles, which are best since the metal attacks the cementing material in graphite crucibles and cannot be melted in an open-flame furnace because of the oxidation. The crucibles can be thin walled and light in weight. They hold

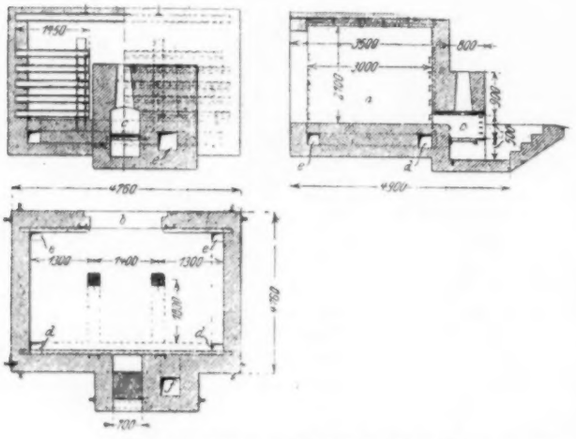


FIG. 6. MOLD DRYING FURNACE

from 6 to 12 litres (about 366 to 732 cubic inches) each, and are comparatively cheap. They are covered with an iron lid during the melting. Care should be taken to heat the metal only a little above the melting point, as excessive heat blackens the surface. As soon as the metal is melted the crucible is removed from the fire and poured at once. Black films floating at the surface of the metal must be removed. The melting furnaces can use, coke, gas or oil or any fuel very low in sulphur. Spills which begin to burn should be extinguished with perfectly dry sand and never with water. It is stated that in the German practice, the total loss in melting, casting and cleaning the crucibles after pouring amounts to ⅞ of 1 per cent of the original metal used. One hundred pounds of metal require about 50 pounds of coke for melting.

After pouring, crucibles are scraped clean with a chisel and filled with water, which is left in them for a day to soften any further crusts. These scrapings cannot be used. The castings must not be removed from the forms too quickly as they are very brittle above 500 degrees centigrade. The cleaning, polishing and finishing of the castings is simple. Gates and runners are cut off with a hacksaw. The sand is easily removed since it sticks very lightly.

USES

The following uses are given:

1. Optical industry: Cameras, marine glasses, navigation instruments, binoculars, periscopes, camera boxes, rails for bellows.

2. Artifical Limb Industry: Whole forms for hands, arms and legs.

3. Automobile Industry: Transmission and engine housings, transmission covers, generator casings, starter casings, small fittings, body construction, fenders, running boards, engine hub caps, radiator frames, hoods.

In October, 1921 the C. F. G. E. was awarded the first prize of 50,000 marks in a piston competition held by the German government. The competition ex-

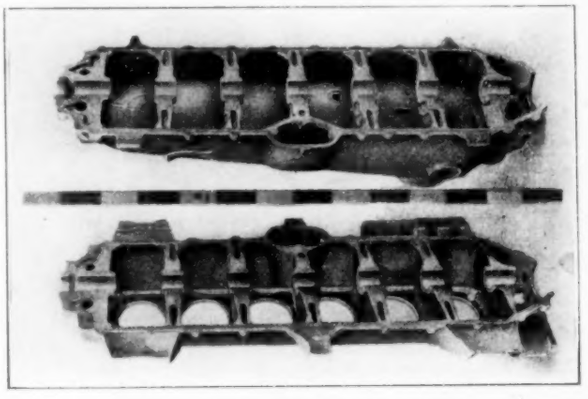


FIG. 7. ELEKTRON METAL HOUSING

tended over a period of a year, and the prize was awarded to pistons made of elektron metal. A number of German automobiles use elektron pistons and connecting rods. The Selve Motorenwerke of Hameln Westphalia are equipped in this fashion. In thirteen races between May and September 1921, the report is that these cars were first in all thirteen, second in six, third in two and fourth in one.

4. Electrical Industry: Casings, brush holders, carbon clamps, armature bases, housings for small motors, base plates for small motors, fan blades, clamps, screws and switches, switchboard construction.

5. Textile Industry: Needle bars, platen beds for knitting machines, spinning machines and looms.

6. Adding machines, where light weight would be advantageous.

FIG. 8. SMALL CASTINGS

7. Typewriters, cash registers, slot machines.

8. Substitute for horn and bone products: Combs, buttons, pocket knives, chess figures, cane and umbrella handles.

9. Trunk saddles and frames for leather goods.

10. Aircraft Industry: Airplane wings, engine housings, engine fittings, rigid dirigible framework construction, fuselage construction, pistons (for

which the advantage is claim of lower expansion than aluminum and the absence of silicon particles hence the possibility of closer fitting). During the war elektron was not used for Zeppelins because Duralumin was an old and tried metal in Germany, and it was thought unwise to risk the use of a new material. It is claimed, however, that the rigid aircraft of elektron can carry 20 to 30 per cent more cargo, than aluminum. It is stated that at the present time

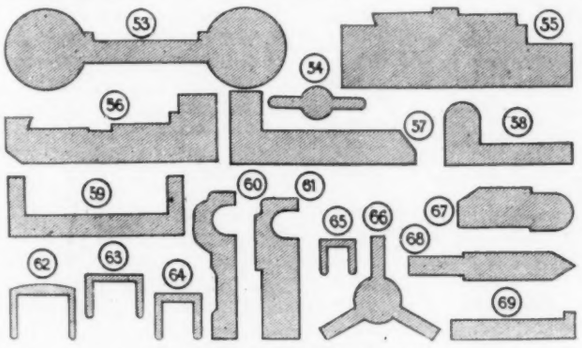


FIG. 9. EXTRUDED SHAPES

manufacturers are selling their product to the simpler, more "prosaic" industries and are, therefore, not pushing it for aircraft.

11. Die-castings: Simple with fairly thick walls.

12. Miscellaneous: Bells (which, it is claimed, have a far-reaching silvery tone, devoid of shrillness), phonograph plates and microphone plates in telephones.

At the present time the largest consumers in Europe are the electrical and automotive industries.

ADVANTAGES CLAIMED

1. It is stated that, comparing volumes, the base price of elektron metal compares favorably with aluminum and 13 cent copper, and that the extras are considerably less than those current in America.
2. Light weight: 21 per cent of copper, brass or bronze; 23 per cent of iron; 66 per cent of pure aluminum alloys and 60 per cent of cast aluminum alloys.
3. The strength to weight ratio is high.
4. The machining time is less than half that of aluminum, brass, bronze and iron, and it is suitable for automatic machining.
5. The castings do not crack or split.
6. It is immune against alkalies.
7. It is not affected by ordinary atmospheric conditions. The gray oxide coating is self-protecting, and it stands up better in damp air than iron.

DISADVANTAGES

1. No soldering medium as yet.
2. Corroded by acids except concentrated hydrofluoric.
3. Corroded by weak salt solutions.
4. It is not good for continuous contact with water.
5. It will not take sharp right-angle bends cold.

To overcome these disadvantages it is recommended that instead of soldering the joints should be made by screws, rivets or welds. Corrosion can be prevented by means of a resistant coating. such as the bakelite enamel previously mentioned. Sharp right-angle bends can be made at 350 degrees centigrade. It is claimed that the advantages of the metal such as low first cost and low fabricating costs, etc., make it worth while to change the design or methods of manufacture to overcome these disadvantages.

The Aluminum Industry for 1921

By ALUMINUM MAN

The condition of the aluminum business existing at the end of the year 1920 continued throughout the year 1921. The plants producing aluminum or fabricating aluminum were either entirely closed or running on very small production. Prices were gradually reduced during the year, but reductions in prices did not result in a corresponding increase in business for domestic producers. This situation was aggravated for the American manufacturers due to the very heavy importation of aluminum in ingots, semi-manufactured and fabricated forms. Government reports indicate that importations have been the greatest in the history of the industry, and the large percentage of aluminum plants that are closed down and the number of operatives that are out of work indicate that much of the domestic demand has been met by the foreign metal.

The automobile business which in previous years consumed a large tonnage of castings for engines, and sheet for body work, has consumed very little, so that the foundries producing aluminum castings have had very little work to do, and the manufacturers of automobile bodies have also either been closed or operated on a reduced schedule.

The cooking utensil business has been perhaps the least affected of any of the uses of aluminum, although manufacturers report that they have lost a great deal of trade due to the flood of German and Swiss utensils that have poured into the country for the past years, which are offered at retail prices less than the cost of manufacturing the article in America.

Bronze paint powder has become such an established product in the general paint trade that while during the first ten months of the year there was very little consumption the last two months of the year showed a slight increase in the use of aluminum bronze paint powder.

The aluminum foil business is a much similar situation to the bronze powder industry, and while very little was used during the first half of the year it showed a somewhat increased consumption during the second half of the year.

While there has been no great general demand for aluminum electrical conductors, yet aluminum has been purchased for the largest installations being constructed during this year. The result has been that the few large orders have assisted in keeping the cable mills operating under a larger output than other lines of manufacture.

The Aluminum Company of America reports that the high strength aluminum alloy which it markets under the name of 17S in the form of sheet, rod, tubing and wire is finding a great deal of favor and wide application. Its greater use has undoubtedly been hindered only by the business conditions existing in the country.

Last year the Aluminum Company of America started the manufacture of aluminum collapsible tubes at its plant at Edgewater, N. J. This plant is now in operation, and this use of aluminum may be said to be in commercial production.

There have been no new inventions of any marked influence on the trade during the year 1921.

The outlook for 1922 is somewhat brighter than for the year 1921, although indications are that business will not be normal any time during the year 1922.

Phosphor Copper

Its Uses and the Methods of Obtaining the Best Results

Written for The Metal Industry by JESSE L. JONES, Metallurgical Editor

Phosphor copper is constantly increasing in popularity as a deoxidizer. It was originally used as a safe and convenient means of adding a definite amount of phosphorus to the various tin or tin-lead bronzes. More recently many founders have found the addition of a few ounces of phosphor copper per hundred pounds, decidedly beneficial to practically all their brass mixtures, as it cleans the metal and increases its fluidity. We even find small amounts being added to alloys as high in zinc and as manganese bronze.

In the case of rolled alloys smaller amounts of phosphorus are used, about one-tenth of one per cent being the usual practice for rolled phosphor bronze with a tin content of 3.5 per cent, and the rest copper. By obtaining complete oxidation and yet avoiding any excess of phosphorus, claims have been made that a 90 per cent copper, 10 per cent tin alloy can be rolled, provided the metal is broken down cold and frequently annealed.

The amount of phosphorus necessary to deoxidize any alloy probably depends on whether ingot copper or scrap copper is used in the mixture, also on how carefully the melting is done. In the case of standard bearing bronze containing aproximately 80 per cent copper, 10 per cent tin and 10 per cent lead—it is usually considered that phosphorus does not appreciably harden the alloy until it exceeds 0.60 per cent. This amount of phosphorus is considered by many sufficient to cleanse the alloy from dross, oxides, etc. The metallurgist of a large Western railroad system recently informed the writer that in the case of bearings that are used without a babbitted lining, he insisted on a phosphorus content of at least 1.00 per cent and did not consider that complete deoxidation and clean castings could be had under that figure.

The Pennsylvania Railroad specifications for bearing bronze calling for 0.80 per cent of phosphorus was for many years considered standard, but present practice among makers of bearings is to use 0.25 to 0.35 per cent or less. It has been found that unless very great care is observed in keeping the pouring temperature low, the sand of the molds is fluxed and burns fast to the castings. It is impossible to machine such castings unless they are pickled in hydrofluoric acid to remove the sand. By using a good facing on the molds and cooling down the metal with gates, etc., castings free from sand may be obtained even with 1 per cent or more of phosphorus in the mixture.

The effect of phosphorus in hardening an alloy of copper and phosphorus is shown by the following table which gives the physical characteristics of phosphor copper, chill, cast, with phosphorus from 2.5 to 12.0 per cent.

PER CENT PHOSPHORUS	BRINELL HARDNESS	TENSILE STRENGTH	ELONGATION IN 2 INCHES
2.5	92.0	52,800	28.2
3.0	101.0	57,000	23.2
3.5	111.0	57,000	13.8
4.0	115.0	58,000	10.4
4.5	136.0	69,500	15.2
5.0	149.0	76,000	26.0
5.5	156.0	78,250	15.2
6.0	170.0	36,000	0
6.5	197.0	79,000	2.8
7.0	179.0	68,000	0
7.5	187.0	51,550	0
8.0	235.0	68,500	0
8.5	229.0	34,250	0
9.0	217.0	38,500	0
9.5	207.0	39,000	0
10.0	212.0	26,500	0
10.5	212.0	24,000	0
11.0	207.0	37,500	0
11.5	229.0	26,350	0
12.0	223.0	.....	..

As the Brinell hardness of soft annealed copper is about 45.0, it is evident that 2.5 per cent of phosphorus hardens copper very appreciably. It has been suggested that phosphorus hardens copper to a greater extent than tin, and that it might be substituted for it in some cases, but the high phosphorus alloys do not cast well. They set very quickly and if poured rather cold the metal sets before the air and gases of the mold can escape and castings full of blowholes result.

Not only is the Brinell hardness of phosphor copper noteworthy but the tensile strength of the 2.5 to 8.0 per cent grades is rather remarkable and not generally known.

Dealers in phosphor copper usually offer three grades for sale—5, 10 and 15 per cent. The 15.0 per cent grade will assay only 14.50 to 14.75 per cent hence it should not be guaranteed to be above 14.50 per cent. When more than 14.50 per cent of phosphorus is reached some of the higher phosphide of copper is present. This is almost as readily oxidizable as phosphorus itself, so that no advantage is gained by insisting on getting exactly 15.0 per cent or higher.

Users of phosphor copper should always estimate the cost per pound of the phosphorus. Some makers of phosphor copper who use the process of adding the phosphorous to the molten copper by means of graphite phosphorizers, claim that more phosphorous is lost by volatilization and slagging off in making 15 per cent phosphor copper than is the case when the ten per cent grade is made. Hence a higher price per pound of phosphorus is charged for the 15 per cent material. On comparing some recent prices it was found that when using the 15 per cent phosphor copper, the cost of the phosphorus was at the rate of 45 cents per pound, while it cost 40 cents per pound when using the 10 per cent phosphor copper. Using the more modern method of phosphorizing the copper at a dull red heat, this price differential should not exist, as no phosphorus would be lost in making either the 10 or 15 per cent grade.

When prices are such that the cost per pound of phosphorus is identical, it is undoubtedly more advantageous for the founder to use the 15 per cent phosphor copper. It is apparent that 50 per cent more of the 10 per cent grade will have to be used to obtain a given phosphorus content in an alloy. This means an increase of 50 per cent in the freight bill, in the cost of handling, storage space required, etc. It also means an increase in the founder's fuel bill. If the 10 per cent grade is used and 50 per cent more of it added the metal will have to be superheated to enable it to dissolve so much more cold addition, or it will have to remain in the furnace for a period after

adding the 10 per cent phosphor copper, so that it may be hot enough to pour.

The 15 per cent grade is rather brittle and may be easily ground or crushed. A 14 per cent phosphorus content material will just grind, while the 13 per cent is rather tough and will not grind or even break readily. Hence a chemical analysis is not necessary in ascertaining whether the 15 per cent grade has been received, but simply an observation of the physical characteristics of the ingots.

As to specifications for the purchase of phosphor copper, large users generally specify that it shall be shipped in lots of 10,000 pounds or some multiple of this amount. Also that each ingot or slab shall be inspected and any that show shrinkage cracks or which are not flat or slightly convex on top, shall be rejected. Three half pigs are selected from each lot, and the mixed borings are analyzed. An alloy of copper and phosphorus as free as possible from any other substances is desired.

Some users prefer phosphor copper in the granulated or shot form, rather than in the lump or ground condition. Lumps are not very convenient for weighing, while shot are easily weighed and stored. The shot can also be scattered over the surface of the molten metal by hand, so that it will be quickly absorbed. With the ground form, there may be considerable loss in handling unless care is used or the material weighed out in paper bags.

While it is advisable to have any alloy that is being phosphorized with phosphor copper, raised to a rather high temperature before the addition is made, the molten metal should be cooled to a moderate temperature before pouring into sand molds or ingots. This cooling is best done by holding a gate, riser or other suitable piece of scrap below the surface of the molten metal by means of tongs and "stirring" it in as it melts. The rate at which the additions melt, affords a satisfactory method of determining the proper pouring temperature. When the melting slows up appreciably the metal is at the best temperature for pouring.

Phosphorus, itself, is so dangerous to store, handle and use that few brass foundries attempt to use it any more, unless it is impossible to obtain phosphor copper. One also has difficulty in obtaining uniform alloys as the phosphorus loss on one lot may be 25 per cent and on another lot 50 per cent or higher, depending upon the heat of the metal, the skill with which the phosphorizers are handled, etc. Unless the phosphorus is dry and coated with copper, there is always a chance of an explosion. If wet phosphorus, held in a phosphorizer by a mass of wet newspaper, is pushed below the surface of molten copper it is readily seen that a dangerous explosion may result.

Manganese Copper

Uses and Methods of Obtaining the Best Results

Written for The Metal Industry by JESSE L. JONES, Metallurgical Editor

Manganese copper is usually made by melting together 80 per cent ferro-manganese and ingot copper. A flux of lime, soda ash, etc., is used as the melting loss is high, amounting to about 15 per cent or more.

The grade used for casting purposes contains from 25 to 30 per cent of manganese and from 2 to 4 per cent of iron. Some silicon is also present as the ferro-manganese contains from 2 to 4 per cent of silicon. This is an undesirable element in the manganese copper.

The principal use of manganese copper is in the manufacture of manganese bronze. The making of this alloy by the direct use of copper, zinc, tin, aluminum and ferro-manganese is rather difficult and requires considerable skill and experience. By the use of manganese copper, manganese bronze of various grades can be produced with little difficulty, as the melting point of the manganese copper is very much lower than that of pure manganese and its loss from oxidation during melting is low.

The presence of much iron in ordinary brass or bronze mixtures is very objectionable, as it makes black, dirty, castings. In manganese bronze, however, iron is an essential part of the mixture. It is guarded from oxidation by the manganese and aluminum in the manganese bronze mixture. Hence it does not produce black castings, but castings of a beautiful golden color, which are very strong and tough.

While manganese copper, made as above described, is very generally used in the manufacture of manganese bronze, it is the writer's opinion that a much superior manganese bronze can be made by the use of manganese copper technically free from iron. Such an alloy is made by melting pure metallic manganese (reduced from pure manganese oxide in the electric furnace, or by the alumino-thermit process), with the necessary amount of copper to produce a 30 per cent manganese copper or whatever percentage is needed. If iron is wanted it can be added in the form of pure Norway iron. By this method the partly oxidized nodules of ferro-manganese which are at times found in the high manganese-bronzes (such as those running 70 copper, 20 ferro-manganese, 10 zinc and 1 aluminum), are avoided and a less drossy, more uniform metal obtained.

This pure grade of manganese copper is required by the rolling mills which make a number of high manganese alloys that are used for spinning, drawing, etc., where lack of uniformity in the sheet would be very objectionable.

Manganese copper of both the grades described above is cast into small ingots, usually weighing about 5 pounds each. These are more satisfactory than larger ingots because the material is very hard and tough. The difficulty of subdividing the ingots in making up mixtures has led some makers to granulate their manganese copper. The shot form is easily weighed and is readily taken up by molten copper with a minimum of oxidation. It is very essential to avoid oxidation with all the manganese bronzes and manganese copper alloys as drossy metal is very inferior, being low in tensile strength and ductility.

Mud in Nickel Tank

The yellow mud that develops in a nickel tank, from constant use of the solution, is a mixture of iron and nickel oxide. If small proportions of citric acid are added to the nickel solution no sediment will develop, as the iron will be deposited with the nickel, and all the oxide of nickel will become nickel citrate. The nickel deposit is usually whiter when it contains iron.

Not more than ⅛ ozs. citric acid should be added to the nickel solution, per gallon, at any one time, as the solution might become too radically acid and prevent normal deposition until the excess became neutralized by reduction of nickel from the anode.—C. H. Proctor.

Casting Problems

Some Casting Difficulties and Their Solutions

Written for The Metal Industry by W. J. REARDON, Foundry Editor

Casting Aluminum Pistons in Iron Chills

Q.—We are greatly interested in knowing what system is used in the East for casting aluminum pistons in iron chills. We understand there are many different systems, some chill both outside and in; others only outside.

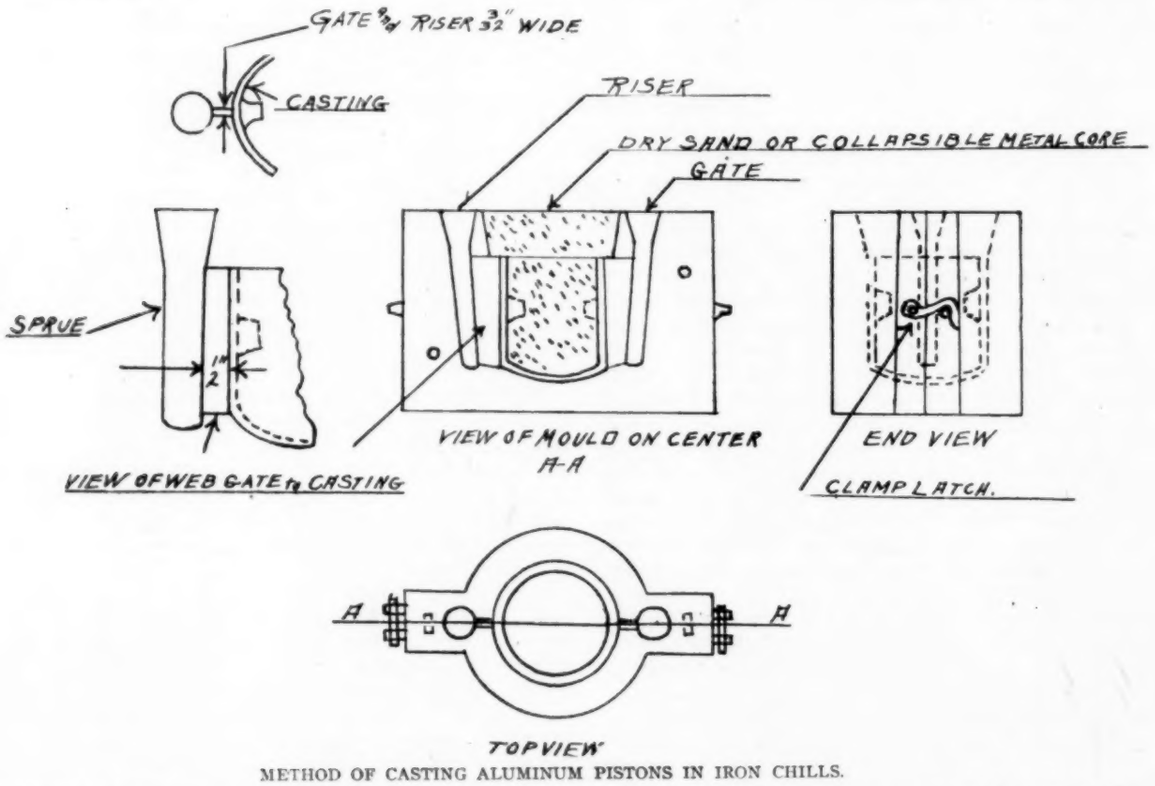
We would like to have a system whereby we could chill just the outside with a dry sand core. We are considering making a chill for the cheek with the green sand cope and drag with dry sand core, four pistons to the box. Is anyone using this system? You understand we do not cast as many as Eastern firms who make a business of it alone, but will probably cast twenty-five one day and then maybe go a week or ten days before casting again.

A.—There are three systems used for making aluminum pistons:—

1. The permanent mold with collapsible steel core.
2. The permanent mold with sand core.
3. Sand casting.

The method which you propose—making a chill for the cheek with green sand cope and drag with dry sand core—I do not think is being used. I doubt if it is practical, as considerable skill is required in gating to produce sound castings, free from pin-holes, either in permanent molds for aluminum pistons or semi-permanent molds.

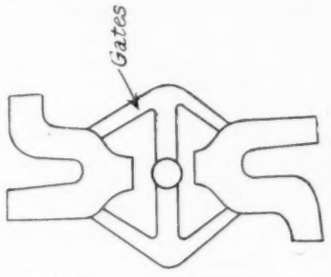
One method of gating and pouring aluminum pistons in permanent molds and semi-permanent molds, that is, where sand cores are used, is to gate like the sketch.



METHOD OF CASTING ALUMINUM PISTONS IN IRON CHILLS.

Brass Sink Traps

Q.—We are now making sink traps of brass, two on a plate. They have an average thickness of ⅛ inch. Each core has its own cast iron dryer. We are having difficulty in making them run, and would appreciate any information that you may give us in reference to proper gating of the



GATING A BRASS SINK TRAP.

patterns. We would also appreciate it if you would give us information leading to a good core sand.

A.—The most essential thing pertaining to sink traps is that it is necessary to have a good, true core. Core dryers should be equally as true as the core box. A number of foundries use half the core box as a dryer as there is no chance of the core getting out of shape. One pin half is made and all the dryer fitted to the pin half. The core should be made with a sand that the metal will lie very quiet. Otherwise, the casting will not run a good mixture. For this class of work, the sand is:

60 parts beach sand.
6 " new molding sand.
1 quart of oil to 66 parts sand.
1 " of molasses and 5 gallons of water tempered to suit conditions.

Most foundries have their method of gating. As a suggestion, I would gate like sketch.

Modern Polishing Machines

A Brief Summary of Some of the Types of Polishing Machines Now on the Market

Written for the Metal Industry by P. W. BLAIR, Mechanical Editor

In the manufacture of many products, such as mechanics' tools, surgical instruments, fire-arms, typewriter parts, plumbing and steam brass goods, cutlery, etc., highly finished surfaces are required to improve the appearance of the product. Polishing is, therefore, a very important branch of the manufacturing process. For work of the general classes mentioned the same style of polishing lathes or machines are employed.

Polishing operations are for producing a smooth bright surface, and differ from grinding, which is done primarily to remove material in order to finish parts to a definite size within close limits. In machine tool work, most parts are more accurately finished in the grinding machine than in the lathe and in the majority of cases work is simply rough turned and then ground to a size in a cylindrical grinding machine. It is a slow process when the article has to be finished to a very close limit and with a fine polish. Still there are a large number of ordinary machine parts in which close limits are not essential, but a high finish or polish is desirable.

Everyone in a polishing department is familiar with the chatter and vibration from the plain-polishing lathe after the bearings have worn slightly and it is interesting to see how far this is tolerated by the men who operate them. They lose a vast amount of time adjusting the bearings and taking up the lost motion or wear until it is impossible to turn out first class work without re-babbitting the bearings. There is no reason why a polishing lathe should not run as smoothly and with as little trouble as an electric motor. This is easily accomplished by a trouble-proof polishing machine, properly made in the first instance and equipped with bearings which are free from initial clearance and sliding friction. Grit from polishing wheels, shop dust and other abrasive substances which in plain bearings cause wear on journal and shaft cannot possibly intrude into a ball-bearing housing properly designed. Lubrication is needed at infrequent intervals, consequently they require less oil and attention. Figure 1 shows a typical double spindle ball bearing polishing lathe. This machine has not overhead belting. Oil rings are unnecessary. Rubber belts are cheaper than leather, but they must be guarded against the possibility of oil leaking and rotting them. Leather belting is safer to use on plain polishing lathes. With a ball bearing machine rubber belts can be used due to the decreased danger of oil leakage.

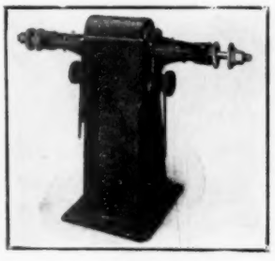


FIG. 1. DOUBLE SPINDLE BALL BEARING LATHE.

Fig. 2 shows a motor-driven polishing head. The individual motor-driven polishing lathe with a separate motor attached to each machine, makes an installation expensive, although this form of drive is the most flexible when it is desired to have a variation of speeds. In the group drive, the motor drives a short length of line shafting, from which in turn the polishing lathes are driven.

The disc grinder or polishing machine has come into general use in the past few years for general use on flat surfaces. The amount of stock to be removed, the area of the general surface and its distribution, are important factors in disc grinding or polishing. The removal of from 0.005 inch to 0.050 inch of stock will usually clean up a surface. The following figures taken from actual practice, represent allowances used on the Besley and Gardner machines:

Drop forged wrenches, 0.008 to 0.015 inch.

Brass Hexagon nuts up to 2 inches in diameter, 0.015 inch.

Larger sizes up to 0.250 inch.

The amount of stock that can economically be removed by disc grinding depends largely upon the nature of the material being ground.

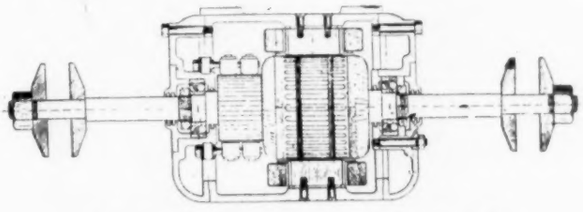


FIG. 2. MOTOR-DRIVEN POLISHING HEAD.

The strap polishing machine has been superseded by the circular polishing wheel and is now used only on special work or parts of same where the circle wheel is inaccessible to certain sections or parts of the piece. The strapping attachment is connected or driven from one of the spindles of a modern polishing lathe and can be set to use any desired length of straps.

Owing to the different grades and classes of polishing wheels now on the market with their resiliency or pliability, they can be used on irregular surfaces and they come in contact with every corner and curve on the work.

A patent polishing and finishing machine manufactured by the Production Machine Company, Greenfield, Mass., which is widely used for polishing pipe and tubing by the bedstead manufacturers, also stove manufacturers, is the type A machine. See Figure 3. It is used for cylindrical work in long or short lengths and fed through the machine automatically by a power feed attachment. Where it is desired to finish articles having round shanks, such as screw drivers, drills, taps, etc., the pieces are fed to a stop, only the portion to be finished being presented to the abrasive belt. Small articles, cylindrical form, may be fed automatically through hopper fixtures. Figure 4 shows a type R machine which is a combination disc grinder, polishing wheel and belt surfacing machine.

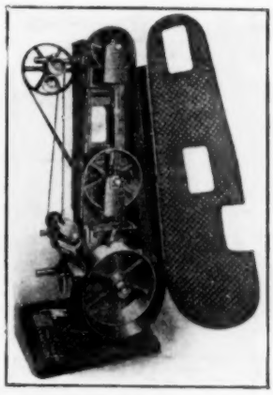


Fig. 3. TYPE "A" PRODUCTION POLISHING MACHINE.

The improvements on polishing lathes have gradually developed so that there is now on the market everything from the plain babbitt bearing spindle to the modern automatic or production lathe.

Automatic polishing machines which are now being used to a large extent have a special attachment that works in connection with the polishing lathe. Figure 5 shows machine manufactured by the Acme Manufacturing Company, Detroit. The Automatic Buffing Machine Company, Buffalo, N. Y., manufactures a machine of the same description or type for various kinds of work, such as aluminum cooking utensils, electrical goods, plumbers' supplies, etc. The work is held by spring or air collect attachments, and increases production to a large extent over hand polishing or buffing as one operator can operate two heads and he is occupied feeding and unloading the machine only.

FIG. 4. DISC GRINDER, POLISHING WHEEL AND BELT SURFACING MACHINE.

The St. Louis Machine Company has built a line of polishing lathes with special features, also the Hill Curtis Company, P. Pryibil Machine Company and Builders Iron Foundry Company. The different polishing and platers supply houses carry a full line of the different polishing which have their own distinguishable features and their trade mark, as they are equipped or have a feature which commends them to different ranges and classes of work One distinguishing feature, is the stopping of one head of the machine to remove or replace the wheel without interfering or stopping the production of the operator on the other spindle.

The motor driven polishing machines are being used extensively and have proved successful on certain different classes of work. Some are manufactured by the Eager Electric Company, also the Connecticut Dynamo and Motor Company, and some of the large manufacturers are adopting the motor driven machines with individual motors, as it eliminates all countershafts and loose pulleys, also belts.

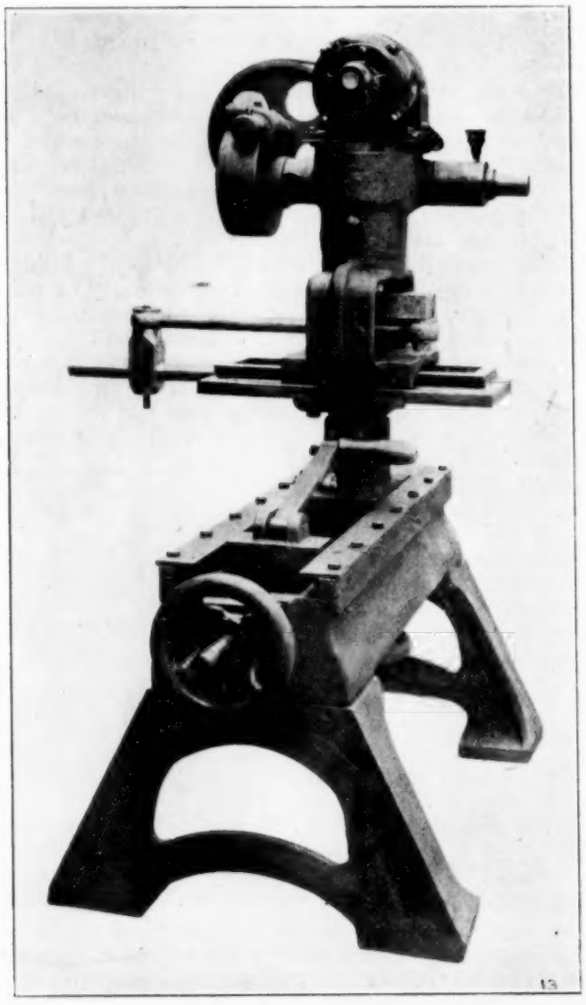


FIG. 5. ACME POLISHING MACHINE.

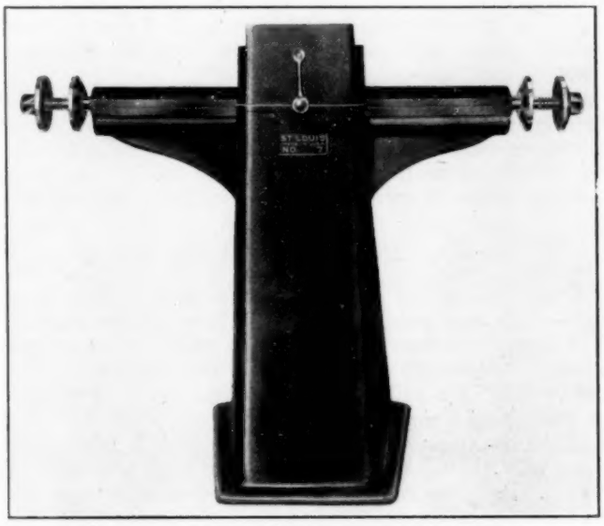


FIG. 6. ST. LOUIS DOUBLE SPINDLE MACHINE.

Defective Castings

Q.—We are manufacturing a line of Steam and Water Brass Specialities and melt our metal in an oil fired tilting non-crucible furnace and pour same into moulds with a No. 40 crucible used as a ladle and heated before being used. After castings are machined and subjected to a hydraulic pressure test of 200 lbs, twenty per cent. leak. Some of the castings are spongy, others contain blowholes. The metal we use consists of brass ingot, yellow brass, and we add a certain percentage of aluminum to deaden the fumes.

A.—The ingot you are using must be of a low grade and cheapened to the limit. It does not pay to use such metal! The loss of production due to bad castings many times offsets the advantage of cheap metals. Aluminum cannot be used for pressure goods.

The remedy is to use a better grade of ingot metal. The blowholes are due to improperly vented cores or to cores that are rammed too hard.

It would pay you to manufacture your castings from a red brass mixture of copper 85, zinc 5, lead 5, tin 5.

Should your requirements call for a yellow brass mixture to stand up under severe pressure use copper 65, zinc 30, lead 3, tin 2.—P. W. BLAIR.

Foundry Mixtures

German Silver		Aluminum Force	
Copper	60 lbs.	Copper	3 lbs.
Nickel	18 "	Aluminum	¼ "
Zinc	22 "	Antimony	¾ oz.
German Silver		**Casting Aluminum**	
Copper	1 lb.	Aluminum	80 lbs.
Nickel	6½ oz.	Zinc	16 "
Zinc	9½ "	Copper	4 "

The Application of Decoration to Art Metal Ware

A Series of Articles Which Describe in a General Way the Various Processes and Methods Used in the Decorative Application of Ornament to Art Metal Ware. Part 3*

Written for The Metal Industry by A. F. SAUNDERS, Designer, The Benedict Manufacturing Company

SAW PIERCING

The art of saw piercing as a means of decorating art metal ware has not, as some may believe, been entirely supplanted by the use of piercing dies. Although a large proportion of the cheaper grades of both Sterling and Plated wares seen in the shops today are pierced by purely mechanical methods, there is still, and always will be, many of the higher grades of pierced Silverware that represent hand work.

FIG. 1. SILVER AND COPPER VASE. DECORATION ETCHED IN REVERSE.

Die piercing is limited almost entirely to flat surfaces, as once the piercing is done it will not stand much manipulation of the metal without distorting the piercings forming the design. Shaped piercing dies suitable for use on curved forms are necessarily limited to the simplest sort of designs and are not only expensive to make but difficult to keep in good working order. Die piercing may represent quantity production, but such work is purely mechanical and does not possess that touch of human interest that gives value to a piece of hand work.

The art of saw piercing was first applied in a decorative manner to silverware, in England, during the Queen Anne period, 1702-1712 A. D. The art is perhaps the outgrowth of perforating metal as practiced by the craftsmen of the Orient, though their method of cutting out the background of an engraved or chased design by means of small punches or chisels is both laborious and crude as compared with the delicate clean cut effect produced by saw piercing. Although the process is a simple one it requires great skill in handling the delicate saws, as the outline of each detail of the pattern must be preserved in a clean cut manner. Jagged edges or a cutting through of any of the connecting parts may spoil the beauty of the entire piece.

The first step is the laying out of the design on the surface of the metal, either free hand in pencil or by means of transfer paper from the original design. This pattern is then made more permanent by lightly scratching in the outline with a fine needle point. The spaces to be cut out are slightly colored with wax crayon to distinguish them from the design proper. A hole is now drilled through each colored space to permit inserting the saw blade. In the sawing out the greatest care is necessary to follow the lines accurately, as any deviation must be corrected by filing and may mean a break in the curve of some detail of the design, marring the beauty of the whole piece.

FIG. 2. SILVER VASE. ETCHED DECORATION.

Ornamental designs for saw piercing are necessarily confined to connected patterns and are most effective as a decorative feature, if in composition, the motifs are symmetrical in character. Much of the solid silver and Sheffield Plate made in England during the 18th century exemplify the artistic beauty of this method of embellishment Some of the finest examples are the work of that celebrated English silversmith, Paul Lamerie. The decorative value of saw piercing was understood also by the craftsmen of colonial days, though in design their efforts were directed along simpler lines As true saw piercing represents skilled handiwork of the highest order, it is costly to execute, and like all other good things has suffered at the hands of cheap imitators. Aside from the use of cutting dies which represent a purely mechanical reproduction, no other method of imitation has met with any amount of success. Etching through the metal has been tried, but the effect appears crude in comparison to the delicate clean cut work of the saw.

Why do we always seek to imitate mechanically the beauty of such handiwork? Our efforts might better be directed to educating the buying public to a higher appreciation of the value of true handiwork in metal wares. We stand in awe before some rare old example of art and skillful craftsmanship displayed in a museum, yet little realize that we have in our midst hundreds, yes thousands of artists and artisans who are just as capable to create and produce and are eager to emulate the finest work of past ages if they but receive the proper encouragement and stimulus necessary to inspire them with the same high ideals in art and craftsmanship.

DECORATIVE ETCHING

The art of etching as a means of applying decorative

*Parts 1 and 2 were published in our issue of January and August, 1921, respectively.

ornament to metal ware is of modern origin. It is a descendent of the art of "copper plate" or so-called "dry point" etching, so finely expressed in the work of the great artist Whistler. Its decorative qualities when artistically executed are such as to place it among the best of the handicrafts, and it is no more costly to execute than chasing, engraving or any other form of decorative handwork.

There are several processes used in etching. The three most important are: (1) The Painting-on Method (2) The Transfer Process and (3) The Photographic Process. In this paper we shall deal with the first method as this is the original and highest form of the art.

As this method of execution depends almost wholly upon skilful and artistic handwork it is, of course, the most expensive to produce, yet it is this very fact that adds so much to its intrinsic value as an art. The difficulty in etching lies in applying the so-called "resist" to the metal surface to be etched. When the "resist" has been applied the method of cutting away the surface is practically the same by all processes. The "resist" is used to protect the metal surface that is not to be etched and then, when it has been applied the exposed or unprotected metal is eaten or dissolved away by means of a suitable solution that attacks the metal but not the "resist."

The first step in the process is the cleaning of the surface to be etched. Here, as in enameling, cleanliness is absolutely essential if perfect results are to be obtaind. The best method is a thorough scouring of the metal with powdered pumice stone and clean water, followed by a slight pickling in a weak solution of nitric acid. This removes all grease and produces a clean smooth surface upon which to transfer the decorative design. This is done by tracing over the pattern on paper that has the under side lightly dusted with powdered red rouge. If the article has a curved outline the pattern is transferred in sections, great care being used to insure each section

FIG. 3. STERLING SILVER SAW-PIERCED FRUIT BASKET.

fitting into its proper place. The spaces forming the decorative pattern are now carefully filled in with the "resist" by means of a soft brush. Red sable brushes such as are used in water color painting are the best for this purpose. Every particle of the surface must be thoroughly covered to protect it from the action of the etching bath; the slightest pin hole will show up after the etching is done.

When the "resist" has become thoroughly dry the remaining surfaces not to be etched that is outside of the decorated area, such as the inside and base of a vase or the underside and edge of a tray, are brushed over with hot beeswax to protect them. The article is then ready for the first etching.

There are several methods of eating away the metal; first, with a diluted solution of nitric acid; second, a solution of perchloride of iron, or third, electrolytically by means of a stripping solution. There is little difference in the final result, if one understands how to handle them. Much depends upon the qualities of the "resist"; the electro method puts it to the most severe test.

The background eaten away leaves the pattern in relief, the whole piece is rinsed and the "resist" removed with turpentine. The whole surface, including the etched parts, is then painted over with a fresh coating of "resist." When this is dry it is ready for the scratching in and shading of the finer details of the decorative design. Various size steel etching tools or points are used for this fine work and the skill of the artist has full play. The technique of this part of the process is almost identical with that required of the pen and ink artist in making a drawing in black and white. Metal etching done by the hand method possesses the same artistic effect as a fine pen and ink sketch. Care must be taken in the shading to avoid too fine or closely placed lines, as a broad, clean-cut treatment is by far the most effective.

The line or second etching requires careful watching, that none of the "resist" comes off in the acid bath. But little time is needed to sink these lines deep enough to show up clearly when the piece is colored and finished. When the final etching is done all "resist" and wax is removed and the surface of the metal prepared to receive whatever finish one's taste dictates.

The art of etching presents a wide range of decorative possibilities, as various beautiful color combinations can be worked out by plating one metal upon another, then etching through the plated surface to the metal underneath, for instance, silver on copper, gold on silver, brass on copper, silver or copper on steel. Then by coloring the metals in different tones the most beautiful effects are possible. The range of metals suitable for etching is also wide, including gold, silver, bronze, copper, brass, nickel silver, britannia metal and steel, different etching solutions being necessary for the different kinds of metal.

The next article of the series will describe the use of art castings and stampings.—Ed.

Lead Too Pure for Cathedral Roofing

There is such a thing as too pure lead for roofing purposes. The ancient Gothic cathedrals of Europe were topped with this grey metal that blended well with the stone work and the style of architecture.

Lead was the metal that was specified for the roof of the Episcopal Cathedral of Washington which is now being built, but after it had been applied for some time, it was found that sheet lead on the steep roof slopes had a tendency to flow downward under its own weight and the heat of the sun. The nail holes enlarged and allowed the metal to slip partially off.

Metallurgists of the Bureau of Standards of the Department of Commerce were called upon and they found that the grade of commercial lead used was 99.9 per cent pure, far too pure for satisfactory roofing. They recommended the use of what is technically called "hard lead," which contains approximately six per cent antimony.

Lead roofs on European cathedrals have lasted for 300 to 500 years, and the metallurgists are of the opinion that lead as manufactured in those days had impurities sufficient to harden it for roofing use. U. S. Bureau of Standards.

Plating Costs

A Practical Method of Figuring Costs for Estimating on a Plating Job

Written for The Metal Industry by W. G. KNOX

The question of how properly to establish a system for estimating the cost of electro-plating work has probably occupied the minds of many plant and shop people engaged in this work since the inception of commercial electro-plating. There are probably almost as many methods of getting at costs as there are plants even though many of these methods may vary but slightly. It would be difficult to decide just which method gives the most accurate results. The time element, however, seems to be one of the most important factors in cost calculations.

CONSIDERATION OF OVERHEAD OR LOADING

The plating cost problem is a complex one and to say that it is easily solved is somewhat questionable. For instance, how is the department head or cost clerk going to tell just how much caustic or other grease removing solution is used up in cleaning grease or oil from the parts, and how much acid is used in the removal of scale, discolorations or metal from treated objects for any given batch of work. Again, it would appear to be difficult to calculate the exact amount of buffing composition or wheel waste to charge against a specific job and even if all these and other things were itemized for each separate job, it would be a more or less laborious task. Certainly it would involve considerable clerical work and even then might not be more accurate than some shorter method.

In regard to the power costs and cost of the metal deposited on a given job, it probably can be said that these (silver, gold and platinum excepted) are relatively small compared to the labor spent in the preparation of the work for plating. It has been estimated by some that the proportionate cost of metal and power to labor costs average about one to ten. It is doubtful whether the figures come closer together than one to five. In most cases it would appear to be good business policy to figure the cost of power and metal as part of the overhead. It seems, therefore, to the writer that one of the most practical ways of estimating costs is to establish a loading or overhead system, and for all work passing through the plating department, this overhead charge is added to the actual labor cost. With the noble metals the weight of metal deposited should obviously be included in all cost estimates. The establishment of a fair and just loading charge, therefore, is the crux of the whole situation. With a new department it may be somewhat difficult to arrive at a fair overhead charge, but after several weeks' or better still, several months' operation of the plant it should not be particularly difficult to determine a reasonable figure.

ITEMS IN OVERHEAD

In working up this loading figure, it will be necessary to include the following items:

(1) Cost of chemicals, anodes and running supplies as acids, plating salts, caustic materials, cyanides, cleaning solutions, polishing compounds, water.

(2) Salaries of foremen, clerks and other supervisors.

(3) Rent of space or building and its maintenance and the maintenance of plant equipment and installations of replacement equipment.

(4) Depreciation of machinery and plant equipment, such as current generators, voltmeters, ammeters, rheostats, plating tanks, sand-blasting equipment, steam generating equipment and other accessories.

These expenses listed above cannot be fairly added to any individual job, but if these and other minor expenses occurring in the shop are combined and an average figure worked out, then it should be a simple matter to determine what overhead charge should be added to the actual labor cost. The sum of the labor cost on a particular job plus the loading charge applied to labor for the particular job should provide the figure on which the cost of the plating is based.

Not all plants employ the same methods. Power costs are different, labor costs more in some places than in others, rents are different and maintenance varies; hence the loading factor will likewise vary.

Let us say that in plant A the loading charge is 100 per cent; in plant B 50 per cent and in plant C, because of low power rates, low labor costs, combined with large standardized production and efficiency, the overhead is only 25 per cent. Thus it will follow that the type of work done and the efficiency with which it is handled will determine very largely the total costs.

FIGURING A JOB.

As an illustration of this method of determining plating costs, let us consider the following example in which the power and metal are charged as overhead. Plant B has been operating for a year during which time the accounting department has kept a close record on the costs of the plating department as a result of which the fifty (50%) per cent factor was established. A certain job comes in for finishing consisting, let us say, of 500 parts, 300 pieces of which are iron pieces to receive a zinc coating and 200 pieces are copper to be given a highly buffed nickel finish. The iron parts are, for convenience, handled in small batches which can readily be taken care of by one operator. He strings them on copper wires, passes them successively through boiling caustic to remove grease, and muriatic acid to remove rust and, possibly, through a cyanide to brighten the parts, rinses thoroughly and then hangs the strings properly spaced into the zinc plating solution where they are all plated at the same time for one hour at a current of 410 amperes. The tank voltage is approximately 4 volts. This operator is paid at the rate of 50 cents per hour. The copper parts are first given to a polisher who polishes and buffs each part. This man receives 60 cents per hour for his work. From the polisher the parts are passed along to the first operator who wires or racks the parts, cleans them of the thin film of polish wheel grease in caustic or its equivalent. He then wipes them with a Vienna lime solution, rinses and places the parts in the nickel solution where they are plated for one hour at 150 amperes, voltmeter on this tank reading 3 volts. Now let us assume that operator No. 1 handling the iron and copper parts has consumed six hours in cleaning, washing and plating the work. Then 6 x 50c. = $3.00 for labor. The polisher required three hours for his part of the job. Hence, 3 x 60c. = $1.80. The total labor, therefore, for this particular batch has amounted to $4.80.

Power costs at this plant are 10c. per KWH which is liberal and if based on the tank meter readings have amounted to the following:

Iron parts—zinc plate 410 amps. x 4 volts x 1 hr. = 1.640 KWH.

Copper parts—nickel plate 150 amps. x 3 volts x 1 hr. = .450 KWH.

∴ 2.090 x 10c. = 20.90c. for power.

The true cost, of course, is that power which has been consumed in driving the generator and must necessarily be figured if we are to get the correct charge, but for the sake of illustration the above only is shown. Metal deposited figuring the cathode efficiencies roughly at 90 per cent theoretically would amount to the following:

Zinc 410 amps. x 1.22 grams per amp. hr. x 1 hr. x 90% = 450. g.

Nickel 150 amps. x 1.09 grams per amp. hr. x 1 hr. x 90% = 147. g.

The market prices for anodes at the present time are approximately as follows:

Zinc anodes = 10c. per pound.
Nickel anodes = 55c. per pound.

Therefore the metal taken from the solutions costs respectively about 10c. for zinc and 17.5c. for nickel which, if added to the power figure and these compared with the labor factor apparently do not exceed the ratios above noted. As above indicated the power and metal costs should be included in the overhead.

If the labor figure amounts to $4.80, the loading charge (at 50%) would be $2.40. Hence, the total cost of the plating work would amount to $7.20. Based on this figure the manufacturer or jobber can readily figure what his price estimates should be.

Laying Out a Plating Shop

Problems Which Arise in Planning New Installations

Writer for The Metal Industry by CHARLES H. PROCTOR, Plating-Chemical Editor

Our firm is contemplating purchasing a new generator set. The plating department at present consists of four 80 gallon still solutions and three mechanical plating barrels, all nickel, plating egg beater parts, ferrules, hub caps, and the like. Recently I tried the moving cathode. Do you think that 10 to 12 minutes at 2 volts is sufficient time to deposit any nickel (with the moving cathode)? I find by increasing the voltage the work burns, (I think because it is so close to the anode). We have two work rods and three anode rods in a tank two feet wide. Do you think we could increase the current any by having our work farther from the anode?

As regards the generator, we are at present using the 2 wire system, and have had no experience with the 3 wire, but have been told that the 3 wire system would be better. Do you consider it would? Would you be good enough to point out the advantages of the 3 wire system, if any? As a disinterested party, is there any particular make of machine that you would have any preference for?

In your opinion would cadmium be a good brightening agent in a nickel solution, with a moving cathode? I have tried it with the still cathode with very poor success, but find it excellent in the plating barrels.

A. In our opinion the three wire system would be an advantage to you. You mention the use of two volts upon your still tanks and that the time of deposit is 10 to 12 minutes. The question is what amperage do you carry per square foot of surface? You must have an unusually good nickel solution with high conductivity to give a satisfactory deposit in the time mentioned. The question arises, just how much nickel do you deposit.

B. By increasing the distance between the anode and the cathode you should be able to use a higher voltage, say four volts with an increase of amperage proportionate. A moving cathode is always an advantage. A higher current can always be used.

C. Presuming that you can obtain better results at 4 volts upon your still tanks, then a similar increase upon your mechanical tanks would also be an advantage. Eight volts would therefore be an advantage due to the greater internal resistance of mechanical plating solutions.

D. Presuming that your generator with the two wire system gives, say 5 volts at 500 or 1,000 amperes, if you require say, a minimum of 7 volts for successful results on your mechanical barrels you are handicapped, just as a loaded wagon going up a steep hill with only one horse is, because it takes twice the pull or pressure to carry a load up the hill, that might readily be carried upon a level roadway. Your mechanical barrels are the same as the hill, so that you require more pressure in volts to support your current in amperes.

E. Presuming again that you obtain 1,000 amperes at 5 volts with your present two wire system, then a generator of equal size using the three wire system would give you half the amperage at 10 volts which can be utilized as follows:

250 amperes at 5 volts for still tanks.
250 amperes at 10 volts for mechanical solutions.
This should be ample for your present output.

We cannot state just what make of generator would give you the best results. It would be best to consult THE METAL INDUSTRY Directory and Buyers' Guide.

F. Cadmium is an excellent brightening agent. It should be used sparingly. The metal itself simply immersed in the nickel solution over night, will be reduced sufficiently for brightening purposes through the working day.

It is as noted by you. Cadmium gives the best results in mechanical solutions. If your still solutions are agitated and a very minute quantity of cadmium used, the same results should be obtained.

Gum tragacanth is also an excellent brightening agent. Dissolve say one ounce in eight ounces of hot water and add a few drops per gallon of nickel solution, especially in your still nickel solution and compare the results obtained in the mechanical solutions using cadmium.

Economics of Fuel for Melting Metal

A Discussion of Factors Back of Immediate Fuel Costs

By THOS. H. A. EASTICK

While it is true that the cost of fuel per gallon, pound, kilowatt-hour or 1,000 cubic feet is no indication of the cost per unit quantity of finished castings of standard quality, nor is it any indication of the efficiency, worth or usefulness of a furnace, yet the figures must of course be considered is any discussion of the economics of fuels.

The cost per million B. T. U. affords a very convenient way of comparing the cost of fuels. (For a full discussion of the subject in its larger aspects, the reader is referred to "The Form Value of Energy in Relation to Its Production, Transportation and Application," by C. G. Gilbert and J. E. Pogue, a paper read at the annual meeting of the American Society of Mechanical Engineers, Dec., 1920.) The following table shows the approximate order in which the various commercial forms of fuel, at today's prices, arrange themselves starting with the cheapest:

FUEL	COST PER UNIT QUANTITY	COST PER MILLION B. T. U.
Steam coal	$6.00 ton	$0.25
Anthracite coal	12.00 ton	0.50
Natural gas	0.50 M cu. ft.	0.55
Producer gas (140 B. t. u.)	0.10 M cu. ft.	0.70
"Fuel gas" (350 B. t. u.)	0.30 M cu. ft.	0.85
Fuel oil	0.07 gallon	1.00
Coal gas (city gas)	1.00 M cu. ft.	1.65
Electricity	0.01 K.W.H.	2.93
"	0.015 "	4.40
"	0.02 "	5.86
"	0.025 "	7.50

This table clearly illustrates the meaning of the term recently introduced, "Form Value" of fuels (see above reference). No fixed numerical value can be assigned to a fuel which would indicate its exact form value, but that this factor is of importance is evident by the fact that any other form of fuel would never be able to compete with steam coal did it not possess greater form value. Thus fuel oil possesses a much higher form value than coal on account of its physical state as a liquid together with its freedom from ash, among other valuable properties.

Closely related to the Form Value and the cost of a fuel, is the cost of releasing heat from it. Producer gas is a very cheap fuel and possesses a higher form value than coal (due to its physical state as a gas) yet the cost of the necessary apparatus to release its heat, the furnace, is quite high especially where high temperatures must be maintained, such as in the case where copper alloys are to be melted. Also in the case of producer gas, the operations must be more or less continuous. The cost of releasing heat from electricity is also a vital factor in its use for melting metals. Although electricity possesses a much better form value in comparison with solid fuels, yet its high cost together with the expense of the apparatus and furnace necessary to release heat from it, lead to serious doubt as to the economic value of electric furnaces for melting metals except where chemical processes or unusual local conditions call for the use of electricity.

It is argued that although the cost per million B. T. U. of electricity is very high, yet electric furnaces are so efficient that the handicap of the high cost of power is more than overcome thereby. Inasmuch as this argument is based usually on what must be termed loose comparisons between electric furnaces of some standard type and old-fashioned coal fired pit furnace installations, it is really not so much a claim for the high efficiency of the former as it is a demonstration of the low efficiency of the latter, and it would seem that the logical deduction of this demonstration is that improvement in design of crucible type furnaces is necessary. Even the traditional type of coal fired pit furnace is capable of considerable improvement without changing the fundamental design. A recent installation embodying many such improvements is that of the Norfolk Navy Yard foundry. The furnace equipment was designed and installed by the Foundry Equipment Company, of Cleveland, O.

It is notoriously unsafe to draw any conclusions from published figures on power or fuel consumption in melting. Not necessarily because of the unreliability of the figures themselves, but on account of greatly varying conditions. The composition and form of the metals to be melted, the operating efficiency of the plant, the intelligence and efficiency of the labor, etc., are only a few factors that vary tremendously, so much so that it is impossible to say that because a certain fuel or power consumption per ton of metal melted is obtained in one plant, the same result will be obtained in another. For instance, one well-known manufacturer of furnace equipment, the Wayne Oil Tank and Pump Company, has melted ingot brass and scrap with an oil consumption on 1 gallon per 100 lbs. metal in a tilting crucible furnace. This is interesting in that it demonstrates the possibilities of such equipment. Of course no electric furnace, with the possible exception of the induction type, could compete with this performance. However, it is well known that such a low fuel consumption is the exception rather than the rule with furnace equipment as it exists today, simply due to the varying conditions as mentioned above; in this case, the excellent results obtained are due to unusual furnace design and careful operation.

Unfortunately, although oil is a most convenient and desirable fuel, especially for the medium or small casting shop, there is much to support the view that its future as a fuel for melting metals is dubious on account of its steadily increasing cost and the fact that its form value is almost unique so that competition for it will become keener each year. This fact, however, should not deter anyone from installing oil burning equipment if it is found suitable. The same equipment could be operated with equal success using gas of some suitable type, and the change over could be made at small expense whenever it was found that oil had permanently exceeded the economic limit favoring its use over gas.

There is a vast field of development ahead of the gas industry; the surface has hardly been scratched as far as the realization of the possibilities lying in a ton of coal. Starting with city gas at $1.00 per M cubic feet, and considering by-product coke oven gas at about .50 M and "fuel gas" (a mixture of manufactured gases produced by a process destined in the future to almost revolutionize industrial heating practice) at .30 M, we have three types of fuel of very high form value and low cost, which are eminently suited for non-ferrous melting furnaces.

In connection with the production of gas from coal for industrial heating and power purposes, and as illustrating the trend of affairs in England where the problem of energy for industrial purposes has already reached a stage which we in this country are rapidly coming to, the following statement by Mr. E. C. R. Marks, in discussing a paper by Alan E. L. Chorlton, is significant:

"When they remembered that they could obtain with a gas engine or an oil engine up to 42 per cent thermal efficiency, it made some of them who were responsible for the selling of electric energy, for cost price or something less, as they did in Birmingham, wish that Mr. Chorlton had gone on with the large gas engine problem and had shown them how to get an efficiency of that sort instead of doing the poor best they could with steam turbines, which now held the field. With steam turbo-generators they were not able to do better than 17 per cent efficiency from coal to electricity. He felt that it was only with internal combustion engines that the fuel problem of this country was to be solved. He was constantly reminding his friends in the Birmingham Gas Department that they could nearly afford to give gas away, because they got the price of their coal back in normal years from their residuals; whereas in the production of electricity the coal was burned to destruction, and with it most valuable substances which might be saved if they worked with gas engines or gas driven generators of some kind rather than with steam turbines."

(Inst. Mech. Engineers—Feb., 1915, page 187. Mr. E. C. R. Marks.)

It may be of interest to briefly consider the cost of electricity generated from coal The figures quoted as the price of electricity for industrial purposes vary from 1 to 4 cents per K.W.H. Obviously the price is not much indication of the actual cost.

The overhead and depreciation charges on a large power plant together with fuel and labor approximate 9/10 cent ($0.009) per K.W.H. with the plant operating at 100 per cent load factor, or in other words with the plant operating to capacity. When the plant is operating at a 50 per cent load factor, the cost is increased materially. Most plants are designed to take care of future demand and therefore usually operate at less than capacity and in such cases the power companies offer reduced rates, sometimes as low as 1½ cents per K.W.H., so as to increase the load factor of the plant and so reduce overhead expenses. Such low rates, however, cannot be regarded as permanent; an increase in demand for power will inevitably be followed by higher rates on the expiration of contracts. It is therefore well to make a thorough investigation of this phase of the situation before electrical equipment should be considered. Increase in power cost has caused serious results and perhaps, even financial difficulties in the operations of industrial plants in many instances.

In conclusion it seems evident that remarkable developments in the production and application of gas fuel will take place in the near future in industrial communities of small plants, or in large plants. A very few years will probably see the establishment of by-product coke and gas plants in such industrial communities, to serve local plants with gas and coke for heating and power purposes, with resulting reductions in fuel and power costs which are hardly realized at present. In the meanwhile a policy of caution seems to be the best, as far as electrical melting equipment is concerned.

ELECTRIC FURNACES PROGRESS

In February, 1920, THE METAL INDUSTRY published a review of electric furnace progress showing the furnaces in use and their distribution. In April, 1921, we published another list, which showed the advance between March 1920 and 1921. That advancement should be rapid during this period was to be expected because of conditions throughout the metal business. The last year has seen a considerable slowing up, but this was also to be expected, and the fact that there was any advance at all is decidedly to the credit of electric furnaces. Figures for 1920 and 1921 are shown in the table below.

Type of Furnace	Number Furnaces March 1, 1920	Number Furnaces March 1, 1921
Ajax-Wyatt	118	178
Baily	61	82
Detroit rocking	44	57
Booth rotating	20	40
Rennerfelt	9	13
H. & H. electric reverberatory	..	1
Snyder	7	4
Von Schlegell	..	11
General Electric	..	8
Ajax-Northrup	..	11
Weeks	1	1
Ludlum	1	1
Greaves-Etchells	..	1
	261	408

In response to inquiries about the number of furnaces installed up to January, 1922, we have been advised that the Ajax Metal Company has put in 53 of their standard 60 KW. furnaces for use in melting yellow and red brass. Their total installations to date number 160 and 24 additional furnaces have been planned for. The General Electric Company reports the number of new installations of their furnaces from March 1, 1921, to January 1, 1922. Total number of their furnaces to date—15.

SPOTTED TUBING

Enclosed please find some samples of spotted brass tubing. You will note two kinds, light and dark. The dark was O. K. when shipped. Two weeks later a complaint was received and the shipment returned. The lighter sample showed a brownish discoloration immediately after pickling, which got worse for two days and then stopped. The tubes are pickled in 7% hot H_2SO_4, then dipped in cold 9% H_2SO_4 containing 2% $Na_2Cr_2O_7$. They are then washed in three waters, the last two being free from acid (litmus test) and heated by live steam.

A.—I have examined the tubes and find that about everything that can be is wrong with them. In the first place a good tube could not be made from them from a finish standpoint, if it is desired to have a tube that will hold gas, steam, air or water. I do not believe (without testing) they will do. The casting from which the tubes were made was badly porous. The copper was oxidized either in melting or before being melted, presumably bad scrap was used. The pits or pores have been drawn out in the process of drawing. The walls of these pits had oxide and dirt in them and while the pickle (the final pickle) would apparently clean the surface, the final washing with hot water would start the exuding of more oxide from the pits still below the surface. If you scratch the surface of these tubes you can still find these long-drawn out pits or blow holes. Then too the tubes are badly scratched, possibly from bad dies when drawn. Certainly these are very poor specimens of seamless tubing, and got a poor start in the casting shop. The oxidation shown on the surface will surely develop, whether they are washed in cold or hot water. Hot water will hasten the formation, but the place to stop the trouble as I see it is in the casting. The tubes may also have been over-annealed at some stage in their working, which would account for the rough surface. —L. J. Krom, Rolling Mill Editor.

Foremen, Such as They Are

Good, Bad and Indifferent Shop Leaders I Have Met

Written for The Metal Industry by WILLIAM H. PARRY

As a means of helping those who are troubled with inefficient mechanical foremen and who are seeking efficient foremen of mechanics I shall relate some true stories of foremen who do and don't hold down their jobs at the present writing, fully conscious of the fact that the perfect foreman does not exist.

A machine shop foreman with a crew of fifty odd men and boys under him, speaks English imperfectly due to foreign birth and a fondness for the company of his countrymen. His upturned mustachios, carefully trained, worry him not a little, as does also his personal appearance. In his spare time he beats a bass drum in a religious and very noisy band, and his batting average as a thumper on the devil's own instrument is .412. He is not above exacting tribute from his men, some of whom are foolish enough to supply him with fruit, candy, and shaves. He practices nepotism, and favoritism is his middle name.

Now, what can the morale be in such a department?

Another machine shop foreman, whose daughter had grand opera aspirations, and a voice harrowed with parlor limitations, was forever boasting to his men of the time when Geraldine Farrar, Tetrazzini, and Ponselle would be backed off the boards when his daughter's alleged music teacher turned her loose on an already music-satiated public.

Be it far removed from me to decry a father's fondness for his only che-ild, but the machine shop is no place for the display of anything, but the manufacture of machinery. This poor boob tried to borrow from his superintendent enough money to send his daughter abroad to acquire a foreign reputation, so that on her return she could storm the ramparts held by one Gatti-Casazza, who presides over the destinies of the Metropolitan Opera House, in New York City. Sad to relate the daughter's aspirations have not been realized, her father is a broken old man, and the butt and jibe of the men under him.

Can you imagine the efficiency of this department?

Another machine shop foreman is a "chairwarmer" of the type that anchors for eight of the eight and a half hours' stunt each and every day but Saturday, when he only spends three and three-quarters hours out of the four hour stunt on that day on his throne and seated. The seat of this man's trousers shines like a mirror, which is more than can be said of his intellect in so far as directing efficiency goes.

In this department we have the spectacle of an assistant foreman assisting his foreman in killing time, and they both do it handsomely. One good foreman at wages or salary equal to that paid to both of these worthies, would be the cure for this state of affairs, as nothing worse can happen to a department than to have a lazy man at its head, ably assisted by his assistant, and of course the men.

A foundry foreman of the non-ferrous type, or in plain English a brass foundry foreman, who is a man of considerable ability, able in my estimation to hold his own in almost any company, sets a bad example to his men by his inordinate fondness for cigarettes, or rather the smoking of them, and I might add, the rolling of them. A strange creation this man, in that, while he is exceedingly fond of smoking during business hours, he will not permit any of his men to do likewise. Being of the "hugger-maguffin" type his orders are usually obeyed with alacrity by his men.

This man has two hobbies, religion and politics, and believe me he rides both of them hard. For any of his men to disagree with him on either of these two subjects means, one of two things (and sometimes both), a punching or a dismissal.

Can you guess what this department can show at the year's end? **No you can't,** not in a hundred years, as the output is a glorious one, the workmanship of the very best, and the casting loss the lowest of any foundry in existence, considering the intricate and complicated nature of the work.

"How come?" you may ask, using the slang term of the day, and the answer is a splendidly equipped foundry in every respect, and thoroughly up-to-date. Patterns are mounted on moulding machines and if not, they are so made that a moulder has a decent chance of turning out a "regular" day's work with their aid. Overhead tramrails, open flame furnaces, air hoists, moulding machines, pouring gangs, sand cutters and every known device used in a foundry, are the reasons why the foreman can while away his time puffing on Bull Durham coffin-nails, while discussing the chances of Irish freedom and the religion of the greatest horse of all time, Man-o'War.

A foreman patternmaker of the old lady type, who can talk more and say less than Bryan, is the next on the list. And there are such my fellow countrymen, as much as I hate to admit it, since I have a strong leaning toward that craft.

He watches every move you make, and if you make a mistake, he glowers, fusses and fumes until you are ready to make another one, and frequently do. He deprecates the efforts of all patternmakers not of his time and generation, and in fact makes a general nuisance of himself, instead of handling his force according to their respective abilities and getting the most out of them on that basis.

This old lady foreman of mine was a queer old duck in many ways. He was the filthiest tobacco chewer I ever saw, but was a strict teetotaller. He never swore (in church) but was a dandy at it in a pattern shop. His chief recreation was to dress himself up in an ancient outfit which included a long Prince Albert coat, a high silk hat, and a cane, and stroll forth along the public highways the least frequented by the female sex, as he feared to fall into their clutches, being the most confirmed disciple of bachelorhood I have ever met.

The best foreman I ever met was as nearly perfect as such as one can expect to find on this earth.

He knew his business from A to Z, he lived a clean life, his men never had time to loaf, and if they did, it was only when he was not in his department which was very seldom. Furthermore, his men respected him because he was fair to all and played no favorites; he insisted upon a day's work from every man in his department, including himself.

He did not confide in any of his men in the way of spilling news of his private affairs, and did not encourage this weakness in others. This man was so good as a foreman that the inevitable happened. He was promoted to be assistant superintendent, and is yet. On him devolves the management of one of the biggest mechanical plants in this country, his superiors being only too glad to sit back and let him do all the work while they gather all the "kale."

The Year's Progress in Metals

Annual Review of the Progress Made in the Metallurgical Discoveries of Metals and Their Alloys, and Their Application to the Industrial Arts—Part 1.

Compiled for The Metal Industry by R. E. SEARCH, Exchange Editor

ALUMINUM AND ITS ALLOYS

In the Journal Royal Society of Arts, 68 pp. 791-8, 805-17, Dr. W. Rosenhain gives an account of the manufacture, physical and mechanical properties, microstructure and uses of aluminum and its alloys.

Aluminum alloys and their applications. Metallurgica Italiana 13, pp. 49, 64 (1921), gives an interesting account of Al-Zn (Zinalium), Al-Mg (Magnalium); Al-Ni; Fe-Al and other alloys.

Stages in the re-crystallization of Auminum sheet on heating, with a note on the birth of crystals in strained metal alloys, by Prof. H. C. Carpenter and Miss C. F. Elam, abstract in THE METAL INDUSTRY of June, 1921.

Oxy-Acetylene Welding of Cast and Sheet Aluminum, by P. W. Blair in October issue of THE METAL INDUSTRY.

Aluminum Alloy Pistons, by E. V. Pannall. The use of the metal for this purpose, the treatment and design of the pistons for gasoline motors was given in the January issue of THE METAL INDUSTRY.

Iron-Pot Melting Practice for Aluminum Alloys. Present day methods and investigation of the practice by R. J. Anderson of the Bureau of Mines, in the May, June, July, September and October issues of THE METAL INDUSTRY.

Effect of adding Cu and Al on the mechanical properties of forged and rolled zinc. E. H. Schulz and R. Melaun, in Forschungsarb. Geb. Ing. Sonderreihe, M. (1), 38-42.

Fatigue and Impact Tests of Aluminum Alloys. W. A. Gibson in Proceedings American Society Testing Materials, 20, II, 115-36, states that a sharp distinction should be drawn between fatigue tests made upon materials as cast and those that are forged. In cast aluminum alloys the properties are very much effected by the care taken in molding, melting and pouring. On account of the high shrinkage of these alloys this care is much more necessary than with ferrous castings. In the forged materials the ferrous alloys of either carbon or nickel-steel are much inferior to the aluminum alloys when the comparison is made volume for volume, but as to weight for weight the aluminum alloys are equal if not superior to the ferrous alloys. There is a possibility that in the impact fatigue tests at stresses usually encountered in machine parts, the forged aluminum alloys might surpass certain types of steel when the comparison is made volume for volume.

Piping and Segregation of No. 12 Aluminum Alloy. In the Chemical and Metallurgical Engineering, 24, pp. 217-20, J. D. Edwards discusses the density of a series of Cu-Al alloys for the solid metal at 20 deg. C. and for the liquid metal at temperatures ranging from the freezing point to 1,000 deg. C. These data are taken together with the thermal equilibrium diagram for the system Cu-Al alloys during freezing.

The **Density of Aluminum,** pure, annealed, is estimated to be very close to 2.7. The effect upon the density of small changes in structure and composition produced by mechanical working, etc., are described in Chemical Metallurgical Engineering, 24, pp. 61-4. A graphite densimeter has been developed for determining the density of liquid metals and a series of determinations carried out on liquid alumnum of various grades. The density of liquid aluminum (99.75% Al) may be obtained from the following equation: $dt = 2.382 - [0.000272\ (t-658°)]$. The freezing shrinkage or volume change of aluminum is shown to be close to 6.6%; see also C. A. 15, p. 661.

BEARING METALS

Some Properties of White Metal Bearing Alloys at Elevated Temperatures are discussed by J. R. Freeman and R. W. Woodward of the Bureau of Standards in the February issue of The Metal Industry.

Bearing Metals, by Bruno Simmersbach, Chem. Ztg. 45, pp. 216-9. A complete abstract of this valuable article was published in the September issue of Raw Material.

BRASS

The Hot-Working of Brass, Technique Moderne, 13, pp. 206-9, for brief abstract of this see Chemical Abstracts, 15, p. 2610.

Metallographic Similarity in Different States Between Steel, Bronze, Brass, and Aluminum Bronze. Compt. rend. 171, pp. 350-3.

Effect of Metallic Structure Upon the Corrosion of Muntz Metal is discussed by Henry S. Rawdon, of the Bureau of Standards, a number of photomicrographs are included, see Chemical Abstracts, 15, p. 2266.

Casting of Ingot Brass, by R. Genders. Failures due to the presence of inclusions of non-metallic matter. How these defects may be eliminated by using a suitable form of ingot, abstract in November issue of THE METAL INDUSTRY.

Modern Development in the British Brass Industry, by Ernest A. Smith, in November issue of THE METAL INDUSTRY, concluded in the December issue.

Influence of Gases on High-Grade Brass, by T. G. Bamford and W. E. Ballard read at meeting of Institute of Metals, September 15, 1920, abstract in January issue of THE METAL INDUSTRY.

Extrusion of Brass Problems in March issue of THE METAL INDUSTRY by R. E. Search.

Season Cracking of Brass, by H. Moore, S. Beckinsale and C. E. Mallinson. The more important conclusions which the authors have reached are as follows: 1. Season cracking occurs in a great variety of industrial brasses, differing widely in composition, degree of purity, microstructure, and physical properties. 2. Season-cracking occurs only in material which is maintained in a state of stress, either by external constraint or more commonly by internal stress. 3. Corrosion of the surface and sometimes of the walls of the cracks is frequently associated with season-cracking, but corrosion effects are not always visible. 4. Season-cracking may occur in brass coated with continuous protective layers, such as lacquer. 5. Nickel-plating is probably completely effective in preventing season-cracking, if a sufficient and continuous coat of nickel is secured. 6. Highly stressed articles, capable of developing season-cracks in certain conditions, may be kept for years in reasonably pure atmosphere without showing any sign of cracking, and there appears to be no reason to anticipate

the development of cracks so long as the condition of the surrounding atmosphere does not change. 7. Some agency additional to the presence of initial stress appears to be necessary for the development of season-cracks. 8. Surface defects which might localize stresses additional to the initial stress, do not appear to contribute to the development of season-cracks in brass to any important extent. 9. Corrosion does not necessarily favor the development of season-cracks in stressed brass. Very severe corrosion and pitting caused by the prolonged action of various acids and other corrosive agencies had no cracking effect on stressed brass liable to develop season-cracks in other circumstances. 10. Mercury, ammonia, and ammonium salts readily produce cracks in brass which is sufficiently stressed in tension. 11 Season-cracks almost invariably follow an intercrystalline path. They occasionally cut through a crystal when the path round it is much longer, but resume their intercrystalline path on the other side. The intercrystalline nature of the cracks is a most marked and characteristic feature of season-cracks. Season-cracks and the similar cracks caused by mercury or ammonia always begin in surface layers which are in tension. The greater the degree of hardening by cold-work the less is the brass affected by the intercrystalline weakening action of ammonia or mercury, although it is probable that weakening may occur whatever the hardness of the brass. Liability to the development of season-cracks appears to diminish as the zinc content of brass is reduced. It is considered that copper and zinc-copper alloys containing less than about 10 per cent of zinc are unlikely to fail by the development of season-cracks in service. Protracted heating of highly stressed 70:30 brass at 100 deg. C. does not develop cracks and does not reduce the stress appreciably.

It is obvious that stresses present in brass cannot exceed the yield point (regard being paid to the raising of the yield point which may have been brought about by local or general overstrain), and for this reason it is probable that in practice soft brass is unlikely to fail by season-cracking since the stresses which can exist in it are low. Season-cracking has, however, been frequently observed in brass only slightly hardened by cold-work, but no example has yet come to notice in fully annealed brass. This paper was read at the Meeting of the Institution of Metals held at Storey's Gate, London, March 10, 1921.

In the transactions of the American Electrochemical Society, 41, Mr. H. S. Rawdon discusses **Non-Ferrous Corrosion in Brass** (60:40) which was exposed to sea water for seven years. The alpha constituent (65 per cent Cu) was untouched, while the beta constituent (50 per cent Cu) was corroded by a leaching out of the zinc.

A description of the processes for the **Recovery of Metals from Brass Foundry Wastes**, with an outline of the process, accompanied by the flow-sheets, used by the Rome Brass and Copper Company, Rome, N. Y., and by the Monarch Metal Company, Hamilton, Ont., is given by J. P. Norrie in Canadian Chemistry and Metallurgy 5. pp. 77-9.

Plasticity of Brass Rods Under Percussive Compression is discussed by Fr. Doerinckel and Julius Trickels in Zeitschift für Metallkunde, for October, pp. 466-73.

BRONZE

Plastic Deformation of Copper Alloys at Elevated Temperatures is discussed in the Journal Institute of Metals by C. A. Edwards. For a good abstract of this discussion see Chemical Abstracts 15. p. 2421. Also in Metal Industry for May.

The Casting of Phosphor Bronze is discussed by R. E. Search in the April issue of THE METAL INDUSTRY.

High Lead Bronze, its manufacture and properties by the Associated Editors of THE METAL INDUSTRY in the September issue.

Methods of Casting Manganese Bronze Test-Bars as a Check on Melts of Small Castings, by E. H. Dix, Jr., in August issue of THE METAL INDUSTRY.

Forgeable Bronzes and Brasses, a description of the most important mixtures which can be forged, by R. E. Search, in August issue of THE METAL INDUSTRY.

Bronze Casting by Associated Editors of THE METAL INDUSTRY in the Ostober issue.

Constitution of the Alloys of Cu with Sn, Parts III and IV, by J. L. Haughton, abstract in June issue of THE METAL INDUSTRY.

Erosion of Bronze Propellers, by O. Silberrad, Journal Society Chemical Industry also by N. Belaiev, Journal Society Chemical Industry, 40, 58T and by Wm. Ramsey. Journal Industrial Chemistry, 40, 65-66.

Effect of Lead on Zinc-Bronze Castings. J. Czrochalski, in Zeitschrift für Metallkunde, 13, 171-6. He concludes that lead up to 6 per cent has no harmful effect on the physical properties, a conclusion that is not in accord with the opinions of other metallurgists who have investigated the subject.

COPPER

Thermal Expansion of Copper and Its Important Industrial Alloys, by Peter Hidnert, in Bureau of Standards Scientific Paper No. 410. It gives data on the thermal expansion of 128 samples of Cu alloys of various composition (56 to 100 per cent Cu), heat treatment, mechanical treatment, etc. Discusses the coefficient of expansion and the effect on the coefficient by the addition of lead or tin. For a good abstract see Chemical Abstract, 15. p. 2610.

CHROMIUM

Commercial Chromium Alloys by J. Herbert in Technique Moderne, 13, pp. 197-205.

COPPER-NICKEL ALLOYS AND MONEL METAL

Copper-Nickel Alloys, by P. D. Merica, in Chemical Abstracts 15, p. 2270.

Miscellaneous Alloys of Nickel, by P. D. Merica, in Chemical Metallurgical Engineering, 24, pp. 649-53.

Some metallurgical data are given on the uses and application of various grades of metallic nickel as well as for the principal salts used in electroplating and elctrotyping, and a review of the physical, mechanical and optical properties of pure nickel, with 35 references to the subject, by P. D. Mercia in Chemical and Metal Engineering, 24, pp. 17-21; 73-6, also pp. 197-200.

Monel Metal. The physical properties, microstructure, commercial uses and application are discussed in Chemical and Metal Engineering, 24, pp. 291-4. Its resistance to corrosion and its strength at high temperatures are particularly mentioned.

A summary of the properties, methods of melting and casting uses, handling and working in up-to-date practice of **Monel Metal** was given by Adolph Bregman in the January and February issues of THE METAL INDUSTRY.

Cupro-Nickel, a description of the process of manufacture from casting to packing was given by H. D. Swift in the October issue of THE METAL INDUSTRY.

This article will be concluded in a later issue—Ed.

Signs of the Times in the Brass Trade

Some Observations Concerning the Present and Future Development and Location of the Rolling Mill Industry

By L. J. KROM, Works Manager, West Virginia Metal Products Corporation, Fairmont, W. Va.

The brass and copper rolling mill of today is a highly specialized machine—all parts of which are synchronous. No longer is science shut out and ignored as was the case ten or fifteen years ago. The management of the modern rolling mill plans the execution and production of a lot of say fifty thousand pounds of some copper and zinc alloy with just as much care as an automobile manufacturer does in building an automobile or a clock factory in producing a complicated clock. No longer are the most important steps in the production of a lot of metal, whether it be sheet, strip or rod, entrusted to the ignorant "Rule-of-Thumb" operative. Every move is worked by the works manager and his staff.

The tendency in rolling mill practice is towards mass movement rather than isolated lots of special mixtures. The consuming trade is being educated to the use of few mixtures and the demand today is not so much for a brass of a high copper content as it is for an alloy that will stand up under the operations required to produce some salable article. In other words the mill and consumer are at last working together. The result of this co-operation has been to cut down the list of brass mill mixtures from one of several hundred a few years ago to about a dozen at the present time.

The fact that science in the brass and copper rolling mill has come into its own has had a lot to do with the lifting of the veil of mystery which in days gone by shrouded the industry practically in the section of New England embraced by the Valley of the Naugatuck River. The industry is being placed on a parity with the steel business and in a great many cases steel mill practices are being followed. Witness the individual electrically-operated units, reversing mill, variable speed mills, continuous rolling, annealing and pickling operations. Castings for plates and sheets of copper and brass are approaching steel mill sizes and weights. In fact in some instances steel mill trained engineers have been called in to make over and adapt existing machinery so that it will approach steel mill productiveness.

The trend of the times then, as I see it, is quantity production with due regard for quality and a good weather eye open for means of the reduction of waste.

Contrary to some recently expressed opinions the electric furnace for melting has come to stay. Where mass production of constant composition and quality is desired, and at present this demand is imperative, the electric furnace of the proper type for the operation in hand is the ideal instrument to employ. It is not my purpose to enter into a discussion of the relative merits of the various types of furnaces but it is sufficient to say that I believe that there is now available an electric furnace suitable for practically every demand of the casting shop for quantity production.

The demands of the war upset a popular delusion as to the repeated use of scrap and we know know that good commercial brass can be made from one hundred per cent scrap of good quality even though it be melted over several times. There is another factor in the use of the larger electrical melting unit as it permits of the handling of a larger amount of scrap at less operating cost and with less melting loss due to oxidation. Larger melting units also permit of better mixture control and thus at the start, i. e., in the casting shop, we are enabled to predict with greater certainty the quality of a certain lot of metal and keep better faith with the customer.

The growth of the brass and copper rolling mill has been so rapid and large that we are told now by no less authority than John D. Ryan of the Anaconda Copper Mining Company that there is now an over-capacity. We have in the existing mills a production power he says of fifty per cent. more than the demand. Time only will tell if this is so and it will mean the "survival of the fittest." Those mills which have been kept up to the highest efficiency both as to equipment and management and which also are the best located geographically are the ones that will be fully operated in the future.

FUTURE LOCATION

The trend of manufacture in almost all lines where metals are employed is towards the Middle West and the rolling mill that is supported by "cutting up" shops must follow. We already have a number of mills which have been located for a number of years in Buffalo, N. Y., Cleveland, Ohio, Detroit, Mich., and Kenosha, Wis., which have been greatly expanded and improved and are still undergoing those changes that make for a higher efficiency and consequent lower production cost.

The New England Valley of the Naugatuck is doomed as a dominating brass center. The recent deal whereby the Anaconda Copper Mining Company obtained control of the American Brass Company emphasizes this belief. Only those mills located in the East that are connected directly with manufacturing interests will be long continued. The bulk of the fabrication of wrought metal will be confined to the so-called Western Mills. This is the only way that Western competition can be met most successfully. The double long haul across the country of raw material to and manufactured product from the mill is becoming a serious factor. Power costs are increasing in the East, while they are receding in the West. The East has "hamstrung" itself in the labor proposition and so I believe we can look for some interesting moves in the rolling mill industry before long.

The taking over of the American Brass Company by the Anaconda Copper Mining Company will not, to my mind, seriously affect the independent mills. There is and will be business enough for all. The American Brass Company, it has been stated, consumes in a normal year upwards of 450,000,000 pounds of copper and 150,000,000 pounds of zinc. These amounts are more than the Anaconda Company of its own resources can furnish. Consequently this entering the manufacturing field by a large mining company will, I believe, have a stabilizing effect on the brass trade. At the same time it will remove the American Brass Company from the field of competitive buyers and furnish the Anaconda Company with a steady market for its output.

The combination will, on the other hand, I believe, result in a more rapid building up of the rolling mill business in the Middle West for reasons already outlined. To this end, then, I look for a combination of other interests—perhaps some of the Waterbury Mills combining with Rome and Detroit. Combinations formed with the idea of stemming the tide now so strongly set towards the West and which it seems to me is a perfectly logical outcome, when all conditions are considered.

There need be no apprehension as to the future of brass

and copper. There will always be a demand for enormous quantities of these most useful metals and alloys. There is now in existence an organization known as the Copper and Brass Association, which has the avowed purpose of fostering the use of copper and brass. The efforts of this Association, together with the natural growth and development of American and also foreign manufacture and also the tremendous expansion of the electrical industry will, I believe, go far to soon cut down Mr. Ryan's fifty per cent excess of capacity.

Modern Development in the British Brass Industry

A Discussion Is Given Embracing: Electric Brass Furnaces in England; the Extrusion, Hot Pressing and Forging of Brass; Rolling Mill Practice; Annealing; Composition of Industrial Brasses; and Treatment and Utilization of Scrap Brass—Part 3[1]

By ERNEST A. SMITH, A.R.S.M., M.Inst.M.M., British Non-ferrous Metals Research Assoc., Birmingham, England

PROVISION FOR RESEARCH

Although research has been active during the past decade in dealing with the internal structure of the brasses and their behavior under mechanical and heat treatment, and much knowledge of practical value has been gained, it is generally agreed that there is still urgent need for more intensive research in the future interests of the brass industry. This urgency facilitated the recent formation of the British Non-Ferrous Metals Research Association, which was incorporated in January, 1920, and has for its object the prosecution of scientific and industrial research relative to the production, treatment and uses of non-ferrous metals generally. At the same time it endeavors to disseminate existing knowledge amongst manufacturers by means of a bureau of information and the periodic publication of a bulletin.

The association seeks to co-ordinate and co-operate in all researches being conducted on non-ferrous metals and alloys, and to initiate special investigation into problems that are of fundamental importance to the various industries concerned.

With regard to the brass industry the association has already conducted researches relative to the casting of brass and its properties and reports have been issued to members. Further research on the causes of red stains produced in the manufacture of sheet brass and other subjects is now in progress. Manufacturers are encouraged to bring their problems before the association and to suggest researches that will be of value to the industry. These after the consideration and sanction of the council in conjunction with the special research committees are taken in hand as far as the available funds of the association permit. For the immediate future the most pressing subjects awaiting more exact knowledge appear to be those connected with the economic melting and casting of brass and its mechanical and heat treatment during the numerous processes of manufacture.

In the brass foundry a good deal of information is really necessary which can only be obtained from systematic practical research, which has not yet been adequately done. Amongst the factors of importance in the melting and casting of brass ingots may be mentioned, the design of the furnaces, particularly adequacy and constancy of pull of the flue; laboratory supervision of quality of fuel, particularly in coke-fired furnaces; adequate protection of the metal during melting to prevent oxidation and ingress of gases; rate and method of pouring; shape and thickness of mould, its position and temperature during casting.

At the present time there is little exact knowledge available as to the correct casting temperature, and the best conditions of casting for the various qualities of brasses in use for industrial purposes. As previously pointed out, electrical melting offers great possibilities, and the conduct of carefully planned investigations from the point of view of general foundry conditions and requirements would be of extreme value to the industry. The exact conditions that govern the economic rolling, stamping and hot-pressing of different qualities of brass also require further investigation. New uses for the industrial brasses now in general use are urgently needed and research might well be devoted to an attempt to solve this problem which is so necessary to the future welfare of this important national industry.

Reference has already been made to the increasing attention that is being given to the so-called high tenacity brasses and the need for further research in this direction. Engineers are urgently needing brasses that will withstand service at comparatively high temperatures and under high pressure, and there is a promising field for research in this important branch of the brass industry. Considerable attention has been given in recent years to the production of non-ferrous acid-resisting alloys, and in this connection there appears to be scope for further research work on the addition to brasses of other metals such as titanium and the less known metals, with a view to attaining the object in view.

Problems await solution in connection with the extrusion of brass, as for example the prevention of the "coring" which frequently takes place in bars manufactured by this process. More exact and scientific information is required on the question of soldering and brazing and the composition of the alloys used. Stronger solders are required to meet the more exacting demands of modern engineering practice.

Such in brief are, in the author's opinion, some of the more urgent problems that await solution in the brass industry. Whilst it is true that a large amount of data relative to these various problems has been accumulated in recent years much of this is of little value to the manufacturer owing to the lack of essential details and the unscientific manner in which the investigations have in many cases been carried out. If they had been carried out with due regard to the objects for which the metals and alloys are to be applied in industry the results would probably have been of much greater value. It is now fully recognized that research, the object of which is the acquisition of new knowledge, is a fundamental necessity to progress, consequently the future development of the brass industry will largely be dependent on the extent to which it encourages research and undertakes investigation on its own behalf.

ORGANIZATION AND CO-OPERATION

One of the great lessons that has been learned during the war is the magnificent result of organization and improved methods of intensive manufacture. This lesson has not been lost on manufacturers in the brass industry

[1]Parts 1 and 2 were published in our issues of November and December, 1921.

and during the reconstruction period they have considered what is necessary to be done to make their production more efficient. It has been realized that the solution to progress in industry consists in improved methods of manufacture, improved organization, standardizing processes and reducing the cost of output. There were indications of a desire amongst firms in the same trade to organize, each firm specializing in parts, and progress in this direction has been made. The question of cheapening production in the brass industry by a system of amalgamation, standardization and concentration was brought prominently before manufacturers three years ago by the publication of a pamphlet on a "Scheme of Syndication for the Brass Industry," by Howard F. Smith, of Birmingham.

Another important factor bearing on the question of economical standards is the sad neglect of standardization of types, and the unnecessary variations that have been allowed to intrude themselves, merely to satisfy individual tastes, and because it has been nobody's business to see that they are reduced to a minimum. This question of standardization is one of considerable moment to the future of the brass industry, and it is gratifying to know that it has now been taken in hand by the British Engineering Standards Committee, which hopes in due course to issue specifications to cover all the varied uses to which the brasses are applied in industry. When these are issued they will no doubt lead to the discontinuance of a number of alloys now in use and greater co-operative effort in the efficient and economic production of the accepted standard alloys, the value of which was emphasized during the war period.

From what has been stated in the foregoing pages it will be evident that considerable progess has been made in the British brass industry during the past decade and that manufacturers as a whole are awake to the fact that the industry has now entered upon a new era of its history. Consequently they are taking steps to effect the reconstruction that is so vital a necessity if the industry is to maintain that position in the world's markets which the high quality of its products has secured for it in the past.

The Disarmament Conference and the Metal Business

The statement of Charles M. Schwab, and other men of importance in the steel industry, has shown that makers of munitions do not lag behind in their honest desire for peace, and their approval of the efforts of the Conference now going on in Washington.

Aside from the first and greatest consideration—the saving of human life—the manufacturing world along with the rest has learned at last that there are no real gains, no permanent benefits derived from war. Tremendous booms, millions in paper profits, and greatly extended plants end in slumps, huge sums written off as inventory losses and a heavy overhead burden in the shape of large plants, for which there is no use. The inevitable cycle carries business from "expansion" to "re-organization". The best and surest way to grow is along the lines of legitimate, steady, human needs and desires, of which war is not one. Sometimes such growth is very rapid as in the automobile industry, but even when it is slow it is built on the solid ground for production, for construction—not for destruction.

F. S. Chase
PRESIDENT OF CHASE COMPANIES, WATERBURY, CONN.

We quote the opinions of two men of real prominence in the metal industries. The opinions of these men, closely connected as they have been with the manuture of war materials, can be taken as representative of the best elements in the industry.

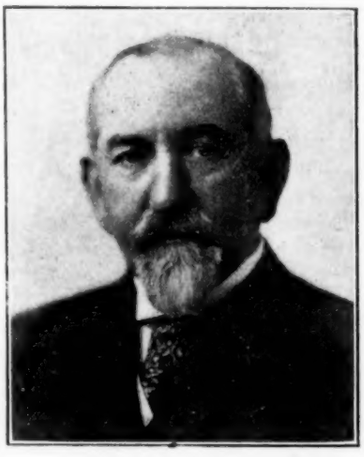
F. S. Chase

"We recognize of course the fact that more or less capital will be scrapped that has been invested in special facilities for manufacture of munitions of war. On the other hand, we would not for a moment question the fact that ultimately the requirements of peace will far more than offset the demands for war equipment.

War means destruction; the requirements of peace, construction and development and progress."

Charles F. Brooker

"I believe that everybody should hope that the Disarmament Conference, now being held at Washington, will be successful in its efforts to abolish war-like machines and establish peace in the world. To use up all of the good materials that we have on the earth, spend millions of dollars of the country's resources in the building of battleships, only to be scrapped in the course of fifteen years is a practice that is absolutely silly and should be stopped."



Charles F. Brooker
CHAIRMAN, BOARD OF DIRECTORS, AMERICAN BRASS COMPANY, WATERBURY, CONN.

As regards the effect of the scrapping of so much war material upon the metal business, there is comparatively little to fear. Most of the war scrap of copper and brass has already reached the market and is to a great extent consumed. We have been advised by the Navy Department that in a battleship designed for a displacement of 43,000 tons approximately 600 tons of non-ferrous metal are used, or about 1.4%. Supposing for the moment, as much as 2,000,000 tons of war vessels should be scrapped, this will mean the dumping of 56,000,000 pounds of non-ferrous material. Although this is a considerable amount, the world market has already absorbed so many times this figure in scrap copper and brass, that it should experience no further difficulty.

We have been advised also that so far as the plating industry is concerned the amount of plated work on battleships is small, being largely hot zinc coatings. A few fittings may be zinc plated, and although there is a fair amount of nickel plating on brass hardware, plumbing fixtures, gauges, etc., the loss of the total amount will hardly be felt by the plating industry.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER, THE ELECTRO-PLATERS' REVIEW

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Contents

Elektron Metal 1
A New Alloy of Magnesium.....By ADOLPH BREGMAN

The Aluminum Industry for 1921..... 5
By ALUMINUM MAN

Phosphor Copper 6
Its Uses and the Methods of Obtaining the Best Results.
By JESSE L. JONES

Manganese Copper 7
Its Uses and Methods of Obtaining the Best Results.
By JESSE L. JONES

Mud in Nickel Tank..... 7
By CHARLES H. PROCTOR

Casting Problems 8
Some Casting Difficulties and Their Solutions.
By W. J. REARDON

Modern Polishing Machines..... 9
A Brief Summary of Some of the Types of Polishing Machines Now on the Market.....By P. W. BLAIR

Defective Castings 10
By P. W. BLAIR

Foundry Mixtures 10

The Application of Decoration to Art Metal Ware.. 11
A Series of Articles Which Describe in a General Way the Various Processes and Methods Used in the Decorative Application of Ornament to Art Metal Ware. Part 3.
By A. F. SAUNDERS

Lead Too Pure for Cathedral Roofing..... 12

Plating Costs 13
A Practical Method of Figuring Costs for Estimating on a Plating Job. .....By W. G. KNOX

Laying Out a Plating Shop..... 14
Problems Which Arise in Planning New Installations.
By CHARLES H. PROCTOR

Economies of Fuel for Melting Metal..... 15
A Discussion of Factors Back of Immediate Fuel Costs.
By THOMAS H. A. EASTICK

Electric Furnace Progress..... 16

Spotted Tubing 16
By L. J. KROM

Foremen, Such as They Are..... 17
Good, Bad and Indifferent Shop Leaders I Have Met.
By WILLIAM H. PARRY

The Year's Progress in Metals 18
Annual Review of the Progress Made in the Metallurgical Discoveries of Metals and Their Alloys, and Their Application to the Industrial Arts.....By R. E. SEARCH

Signs of the Times in the Brass Trade..... 20
Some Observations Concerning the Present and Future Development and Location of the Rolling Mill Industry. By L. J. KROM

Modern Development in the British Brass Industry.. 21
A Discussion Is Given Embracing: Electric Brass Furnaces in England; the Extrusion, Hot Pressing and Forging of Brass; Rolling Mill Practice; Annealing; Composition of Industrial Brasses; and Treatment and Utilization of Scrap Brass—Part 3.
By ERNEST A. SMITH

The Disarmament Conference and the Metal Business 22
By F. S. CHASE and C. F. BROOKER

Editorials 24
Retrospective
Review of 1921—Outlook for 1922.

New Books 26

Technical Publications 26

Correspondence and Discussion 27
Keep the Work Bench in America.
How the Anaconda Company Was Named.
Business Picking Up.
The Call of Brass.

Shop Problems 28

Patents 30

Equipment 32
New Burnishing Barrel.
New Furnaces.
Grinding and Polishing Machines.
New Electroplating Salts.
New Metal Preservative.

Associations and Societies 34

Personals 37

Deaths 37

Trade News 38

Metal Market Review 46

Metal Prices 48

Metal Chart 50

Metal Production for 10 Years..... 51

Supply Prices 52

EDITORIAL

Retrospective Review of 1921—Outlook for 1922

At the end of 1920 it was generally conceded by all, except perhaps those on the very "inside," that business was taking a temporary rest and would very shortly rise to at least respectable proportions. The phrase which ran in the minds of most men, at least in the metal field, was "Wait until Spring." Spring came, and due, perhaps as much as anything else, to the general attitude, there was a very noticeable revival. This revival, however, was short lived as it was based on hope more than anything else, although enormous quantities of metals and metal products were then, and are now, badly needed. They could not be bought by the consumer and consequently could not be manufactured or sold because there was no market. The original slump which began at least ostensibly as a "buyers strike," continued until the buyers, hit along with the sellers, by the general shut-downs, were not only unwilling to buy, but unable.

At present the situation is, if nothing else, at least better understood. There is no question about the need for materials of all sorts, both in this country and abroad. The only difficulty is that of inability to buy. We are now at the point, with so many mills shut down and consequently so many out of employment, that we cannot buy because of lack of funds, and it will be difficult to obtain these funds without starting up the plants which are idle, and the plants which are idle cannot be started up until the public begins to buy. From this vicious circle, the only escape is a gradual and very careful resumption. Of course, resumption is impossible without complete deflation beforehand. A part of this deflation has already taken place, but not all of it has reached the public. Not until it does reach the public will business be ready for its real upward swing.

METALS IN 1921

In contrast to their courses in 1920 there was very little fluctuation in prices of metals during the past year. W. T. Partridge, in his Metal Market Review, published elsewhere in this issue, goes over their courses in detail.

TECHNICAL ADVANCEMENT

Technically, there has been no startling advance during the year. It was not a period of extraordinary advancement because conditions were such as to make extended work impossible. A great deal of excellent work has been done, however, both by individual concerns and by the Government agencies, the Bureau of Mines and the Bureau of Standards.

The Bureau of Mines has done much at the Pittsburg Experiment Station along the line of improving aluminum alloying and casting practice. Investigations have been carried on for the prevention of cracks in aluminum alloy casting; disintegration; aluminum manganese alloys; analysis of aluminum and aluminum alloys; the contraction and shrinkage of aluminum alloys; and the affect of remelting aluminum alloys. This work has been under the supervision of R. J. Anderson, who has written an extended article on Iron Pot Melting Practice for Aluminum Alloys, which is running serially in THE METAL INDUSTRY. The work of H. W. Gillett at the Ithaca Station on electric furnaces and his very valuable compilations of the statistics on the uses and adaptabilities of the various types of furnaces now on the market, are too well known to need much further mention.

An investigation of great importance has been begun by the National Research Council, in co-operation with the American Foundrymen's Association and the Institute of Metals Division, on molding sands. The committee has already been organized and has begun work. Some of the representatives of the non-ferrous metal work on this committee are R. J. Anderson, J. L. Jones, C. P. Karr, H. F. Staley and F. L. Wolf.

A very commendable trend during the past year has been the movement toward standardization. In a large measure this movement received its impetus from the work of Secretary of Commerce Hoover, who has made it the business of that Department to gather information and to spread it among manufacturers and business men to the full extent of the ability of the Department. Beginning his work by obtaining information and suggestions for the Department from all possible sources, he is now putting them into effect. Much still remains to be done as the whole movement is comparatively young, but the outlook is decidedly encouraging. An interesting feature of the operation of the Department of Commerce is that although the over-all costs have decreased, the appropriations allowed the Bureau of Standards and other scientific bureaus in the Department, have been increased. It is noteworthy that the Bureau of Standards is now co-operating with the American Electro-Platers' Society and the American Electrochemical Society. One particular problem is that of nickel solutions. The Bureau of Standards work on metals is too well known to need additional mention.

Through the American Engineering Standards Committee, the various technical and scientific bodies are co-operating to eliminate, so far as possible, unnecessary types of machines, materials and supplies and to make simpler their manufacture and replacements. These standards are already being utilized by the Department of War. The Department of Commerce and the U. S. Geological Survey are co-operating in obtaining statistics for forecasting the future consumption and prices of materials. As George Otis Smith, Director of the U. S. G. S. stated, "business prosperity will be obtained only through, as has been finally termed, a great transparency in industry." By this he meant simply that up-to-date statistics of production and consumption were necessary.

AIRCRAFT

One occurrence of utmost importance was the failure of the ZR-2 dirigible during its trial flight. This catastrophe has cast a shadow over dirigible aircraft development, and also over aluminum for construction purposes. Final reports on the cause of the failure have not yet been made, but will be of tremendous importance.

ELECTRIC FURNACES

Electric furnaces, the progress of which is noted elsewhere in this issue, have continued their advance. No new types radically different from the old were developed. Improvements have been made but the basic principles of electric melting furnaces have remained the indirect arc, resistance and induction. An extended discussion, from the standpoint of the user, in the columns of THE METAL INDUSTRY during the past year, covers in detail the advantages and disadvantages of electric and crucible furnaces under all sorts of conditions.

THE TARIFF

With the coming of a new administration, the business policies also changed. Large problems are facing

the Government, both domestic and foreign. The domestic difficulty was, of course, the depression. This administration chose two methods of attack—the tariff and tax revision. The revision of taxes downward seems to have met, in principle at least, with general approval. At the present time the tax bill has gone through both Houses, and been signed. It remains to be seen just how much effect the removal of excess profit tax and the use of the corporation law, lowered income tax, and the removal of the large number of the nuisance taxes, will have on business. The tariff was not quite so simple. Before the war, America was a debtor nation, consuming almost all of its own production and had comparatively little foreign trade to worry about. Since the war, this situation has changed greatly. We are now a creditor nation. The world owes us approximately $10,000,000,000. Our production capacity has been built up to such a point that domestic consumption can no longer keep it busy. Of course, the domestic consumption is still by far the larger item in our trade, taking from 80 to 85 per cent of the goods turned out. Nevertheless, a large element feels very strongly that this, at any rate, is the wrong time to build up a tariff wall. Europe is heavily indebted to us. It is impossible for her to pay her debts in gold since the most of the world's gold is already in this country. The only way she can pay is by selling us commodities. If these commodities are shut out by a tariff, it will make it impossible for Europe to get on her feet again, and thus not only make her debt to us uncollectible, but prevent her from buying her usual share of our production.

On the other hand, advocates of the tariff claim that with the tariff as it is, it is impossible for American manufacturers to compete, due to the depreciated European currency and to the low wages prevalent there. Foreign goods can be brought into this country at prices ruinous to American manufacturers. A letter from the American Valuation Association, published elsewhere in this issue, entitled "Keep the Work Bench in America," states the point of view of the high tariff advocates.

At the present time it seems likely that a tariff will be passed with rates perhaps lower than those in the Fordney bill, but which will, nevertheless, add considerably to the duties on metals and metal products.

FINANCIAL DEVELOPMENTS

An event of great importance to metal manufacturers is the formation and active entry into the public field of the Copper and Brass Research Association, an organization made up of most of the producers and fabricators of copper and brass for the purpose of reclaiming the fields lost to copper while it was being used so largely for war purposes. The method of attack is investigation into retail sales conditions, and publicity, which will reach the buying public. The claim is that other metals, some of which are cheaper and not so durable, have taken the place of copper in a number of industries. There is no question, of course, of the usefulness of this movement. Nevertheless, this organization will find itself hard put to it to compete with some of the newer alloys in certain fields. It is not, however, so much a matter of getting new business as regaining that which it had lost, and which still honestly belongs to it, and in this respect the work of the Association has an excellent chance of success.

ANACONDA-AMERICAN BRASS MERGER

In our correspondence from Waterbury, published elsewhere, will be found the details of the probable purchase of the controlling interest in the American Brass Company by the Anaconda Copper Mining Company. This merger was commented on editorially in our December number. It is our opinion that it will have the effect of strengthening the Anaconda Copper Mining Company perhaps even more than the American Brass Company. That it will be harmful, however, to the American Brass Company or to New England, as a center of manufacturing, is to be doubted, at least for the present, and we believe for some time to come. What future conditions may make it necessary to do, is impossible to say, but for the present at least we do not believe that New England is likely to lose its supremacy in the brass field. It may be that this step is only the first of a series to be taken by the large producing companies, when the time is ripe. However, knowing the brass business as we do, we may feel assured that any changes that are made will be made slowly.

LIMITATION OF ARMAMENTS

Unquestionably, the one event of greatest general importance of the year, is the Conference on the Limitation of Armaments, now being held in Washington. The whole civilized world has expressed its approval of the object of this Conference, and it is hardly necessary to state that the words "civilized world" includes makers of munitions. The steel men have spoken through Charles M. Schwab, at the recent banquet of the Iron and Steel Institute, and some of them directly in print. In this issue will be found the opinions of men prominent in the metal industries.

INDUSTRIAL RELATIONS

Labor conditions during the past year have been similar to those of the latter part of 1920. Large numbers of unemployed have made it possible to cut wages, in some industries quite sharply with much less friction than might otherwise have occurred. There is no indication, however, of a real policy on the part of the administration, manufacturers or labor unions to come to a basic solution of the difficulty. Stikes have threatened, in some cases have actually occurred, and as yet no plan has been put into operation which can be considered a real solution. The Industrial Court of Kansas comes closer to it perhaps than any other, but the recent difficulty with the insurgent miners makes it seem that even this plan is far from perfect.

Works councils, shop committees and other vehicles of co-operation between management and labor, have suffered a slump, due in some cases to their own failure, in others to the fact that they were no longer necessary, under the changed labor conditions. Profit sharing has gone largely along the same road, to a great extent because there were no profits to share.

WASTE IN INDUSTRY

A report on the Elimination of Waste in Industries, by the committee which was in charge of this investigation for the American Engineering Council, showed a situation which was at the same time interesting and disconcerting. The character of the men engaged in the work makes it command attention, and their results show that wastes in industry are responsible for a large part of the difficulties that industry is experiencing today. Some of these wastes are, of course, inevitable, but most are preventable by better management or more efficient labor. During the past year the cry has been that labor is "slacking," that not enough materials were produced per man. Although this charge is undoubtedly true as a general statement, the report on the Elimination of Waste in Industry shows quite clearly that this is not the only factor involved. According to this report, "over 50 per cent of the responsibility can be placed at the door of management and less than 25 per cent at the door of labor," the rest being due to outside causes.

NECROLOGY

Among the men of prominence in the metal industries who died during the past year were Wilfred C. Sly, Cleveland, Ohio, who was shot and killed by bandits; Adelbert P. Hine, of Woodbury, Conn.; Dr. William App Jones, of Celluloid Zapon Company, N. Y.; Jacob Hasslacher, of the Roessler & Hasslacher Company of N. Y.; Ambrose Monell, of the International Nickel Company, N. Y., after whom Monel metal was named; Karl G. Roebling, president of John A. Roebling's Sons Company, of Trenton, N. J.; W. H. Musick, president of the Musick Plating Works, St. Louis, Mo.; Frank H. Wheeler, Indianapolis, Ind.; Wm. Adrian Jones, of the W. A. Jones Foundry Company, Chicago; Wm. Brown Cogswell, founder of the Solvay Process Company, N. Y.; Charles W. Davis, vice-president Standard Underground Cable Company, N. Y.; Joseph Wm. Richards, Professor of Metallurgy, Lehigh University, Bethlehem, Penna.; John Wittman, president of the Atlas Brass Foundry Company, Columbus, Ohio; John H. Carr, president Union Metal Works, Chelsea, Mass.; Henry S. Regester, secretary of J. Regester & Sons Company, Baltimore, Md.

OUTLOOK FOR 1922

The past year has been such as to discourage predictions. The general tendency at the present time seems to be to sit tight and wait if you can. There are no hopes for a boom, but there is a strong belief that the bottom has been reached and that from now on, for a time at least, the movement will be upward.

Certain great problems stand out which must be, if not actually solved, then at least, contended with. Labor is one of them, and it is to be hoped that we shall make more progress than has been made in the past year or two. The tariff is an unknown quantity as yet and will be an unknown quantity until some time after it has been passed. Foreign competition will have to be met in even more ways than we have experienced it during the past year. When Europe begins to get on her feet, this competition will have effect not only as regards prices, but as regards quality of materials.

The prospect for metals seems to be a fair one, in that they have reached their price levels, and should now go up, or at least hold their own, bearing in mind always the effect of a possible tariff. It is hardly likely that new mills will be built during the coming year, since there are too many old mills working on part time, or not at all. Consumption of metals should be greater, even though Mr. Ford has it in mind to make automobile bodies out of a cotton composition. We do not believe that brass and aluminum makers need worry about the encroachment of cotton on their field, or for that matter, even on the Ford field, since Mr. Ford is doing his very best to obtain the Muscle Shoals plant from the Government, particularly, it is said, for the purpose of producing aluminum.

We enter upon the new year with no illusions, and therefore should have no disappointments. It will not be a boom year, but it should be appreciably better than the last.

NEW BOOKS

Proceedings of the Twenty-fourth Annual Meeting of the American Society for Testing Materials Held at Asbury Park, N. J., June 21-24, 1921. Volume 21 comprising Committee Reports, New and Revised Tentative Standards and Technical Papers.

This volume comprises 1197 pages and contains the annual reports of 31 of the standing committees of the Society and 24 technical papers, together with the discussion on these papers and reports. It also contains 93 tentative standards which have either been revised or are published for the first time; the annual address of the President and the annual Report of the Executive Committee.

The technical papers contain valuable information on results of investigations by experts in the field of engineering materials and the reports of the committees cover Ferrous and Non-Ferrous Metals, Cement, Ceramics, Concrete, Gypsum Lime, Preservative Coatings, Petroleum Products, Road Materials, Coal and Coke, Electrical Insulating Materials, Shipping Containers, Rubber Products, Methods of Testing, Metallography, and Nomenclature and Definitions.

Book of A. S. T. M. Tentative Standards, issued annually by the A. S. T. M. Price $5 in paper and $6 in cloth.

This volume has just come off the press, comprises 518 pages, and contains 127 Tentative Standards as follows. Ten of these relate to non-ferrous metals, twelve to preservative coatings and two to coal and coke.

The term "Tentative Standard" as distinguished from "Standard" is applied to a proposed standard which is printed for one or more years with a view of eliciting criticism, of which the committee concerned will take due cognizance before recommending final action toward the adoption of such tentative standards by formal action of the society. The Standards and Tentative Standards of the American Society for Testing Materials are recognized as authoritative in the field of engineering materials.

Tentative standards given for non-ferrous metals are as follows:

B 17-21 T Non-Ferrous Alloys for Railway Equipment in Ingots, Castings and Finished Car and Tender Bearings.

B 23-18 T White Metal Bearing Alloys (known commercially as "Babbitt Metal").

B 24-20 T Aluminum Ingots for Remelting and Rolling.

B 25-19 T Aluminum Sheet.

B 37-20 T Aluminum for Use in the Manufacture of Iron and Steel.

B 29-20 T Pig Lead.

B 30-21 T Brass Ingot Metal, Graded and Ungraded for Sand Castings.

B 39-21 T Nickel.

Tentative Methods included are as follows:

B 40-21 T Chemical Analysis of Aluminum and Light Aluminum Alloys.

B 41-21 T Chemical Analysis of Nickel.

TECHNICAL PUBLICATIONS

Temperature Problems in Foundry and Melting Room, by John P. Goheen. A paper to be presented at the coming meeting of the A. I. M. in New York, February, 1922. The paper deals with pyrometers for use on brass and bronzes. It covers pyrometer equipment for electric brass-melting furnace, special equipment for brazing brass, core-oven temperature control, and the value of annealing.

The Structure and Related Properties of Metals, published by the Bureau of Standards as Circular No. 113.

2. This circular which replaces one of earlier dates (No. 42, Metallographic Testing) is a comprehensive discussion of that phase of metallography indicated by the above title. The numerous examples which have been used throughout the test have been taken from the results of metallographic examination made by the Bureau, of specimens submitted for examination as well as those used for research. The various methods for revealing the microstructure as well as the meaning of the features revealed are discussed, and a list of reagents for revealing the microstructure included. By means of numerous "live" examples the conditions which affect the structure of metals are discussed, also the effect of structural features upon mechanical and chemical properties of metals. A rather comprehensive discussion of the applications of the microscopy of metals has been given.

CORRESPONDENCE AND DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

KEEP THE WORK BENCH IN AMERICA

To the Editor of THE METAL INDUSTRY:

Ford buys auto plant in Germany; Yale locks to be made in Hamburg, Germany; American Woolen Mills buy eight factories in Germany and Czecho Slovakia; Germany crowded with American buyers; Krupp Gun Works in Germany employs more workers than during the war. These are some of the headlines which have appeared over recent articles in the newspapers of America.

Summed up they mean stagnation for American industry and reduced wages for this country's thousands of workers and wage earners. Men, who gladly gave up their jobs in factories here that justice might be gained in the war with Germany, are today wondering if they will have to go back and ask Germany for employment. For over there factories are working full time and many are operating night and day.

Three very well known American manufacturing concerns are mentioned above. Each employs thousands of workers. What they have been forced to do is but the forerunner of what more will be compelled to do, whose plants in this country have been closed by competition from Germany, where labor is paid but a tenth what it is here and where currency has depreciated from about 24 cents to about one-half of one cent or more than 98 per cent. as compared with the American dollar.

There is before Congress today a tariff bill, designed to provide adequate protection to the American manufacturer and wage earner. In view of the unsettled conditions abroad and the depreciated currencies, it provides that ad valorem rates of duty on imports be assessed on the American value of the article and not on the foreign value, or the foreigner's invoice, as at present.

With foreign values varying greatly, ad valorem rates of duty when applied to them set a premium on cheap labor, that is, any rates determined by Congress to afford protection against imports from Germany will result in a prohibitive duty or an embargo against similar goods made in England, France and other countries which pay wages nearer those in this country and whose standards of living are much like America's, and whose currencies have not depreciated as much as Germany's.

Importers, who are nothing more than American agents for foreign manufacturers and who give employment only to a small clerical force in this country, and retailers, who prefer to buy from the cheap labor countries because they can sell at ten times the profit made on handling American goods, are bitterly opposing the American Valuation plan. They claim that if the duty is raised on cheap foreign made goods, imports will stop and workers will have to pay more for practically everything they buy. An interesting and perhaps appealing argument but absolutely false.

Imported articles never have been sold cheaper in the stores, even though bought at a much lower figure than similar products in America. For instance, you go into a store to buy a pair of gloves. The clerk will show you a pair of American made, retailing at say $3.00 Then he will bring out another pair, priced $3.50 or $4.00, explaining—"Here's a fine imported glove. We have to charge a little more for these since there is considerable expense in shipping them from France or whatever the country may be."

The same holds true with practically every imported article. Although purchased by the retailer at much below the American manufacturer's wholesale price, he generally charges more because the public does not know his purchase price, and is not aware of the ridiculously low costs of goods abroad. Now this retailer complains that if the tariff bill is passed (which no way will affect the American manufacturer's price but will somewhat cut down the enormous profit made on imported articles) the consumer will be made to suffer by higher prices.

Former Secretary of the Treasury, Leslie M. Shaw, declares that this Government is losing from $100,000,000 to $500,000,000 a year as the result of importing frauds and undervaluations under the present law, an evil which the American valuation plan will correct. This money instead of going into the pockets of the foreign manufacturers and the importer should be turned into the coffers of the U. S. Treasury and would somewhat relieve tax burdens on the American public.

The retailer should be made to see that the welfare of his business depends on the welfare of American industry. He does not look to the foreigner, from whom he buys, for his sales. He looks to the American wage earner and if he is out of work because of cheap labor and foreign competition he will have no money with which to buy. Factories can not operate if there is no market for the manufactured product and until American industries are given adequate protection, there is little hope for any improvement.

The tariff issue is most essential to the wage earners and the housewife. Your President, your Senators, your Congressmen, elected to represent you in Washington, should be so informed.

Don't let them shift the American work bench to Germany!

AMERICAN VALUATION ASSOCIATION.

New York City, December 15, 1921.

HOW ANACONDA COMPANY WAS NAMED

To the Editor of THE METAL INDUSTRY:

I note with interest your inquiry as to the origin of the name "Anaconda" and am pleased to give you the following:

After the discovery and working of placer deposits in the vicinity of Butte, quartz mining became active about 1875. In this year the Anaconda mining claim was located by Michael A. Hickey, a pioneer miner, who also located the St. Lawrence and other adjacent claims. These mining claims were located at the summit of a rolling hill, along the surface of which the great Anaconda vein outcropped. Due to the inequalities of the surface, the vein appeared to have a winding course or trend over the Anaconda hill across the gulch to the St. Lawrence mining claim, and thence Easterly. The idea of naming the claim "Anaconda" was obtained by Hickey from the winding course of the huge outcrop of this vein, as above described so that you will see there was a correlation between the name as applied to this mining claim, and the dictionary definition. Later, when the Anaconda mining claim constituted the principal basic element in the group claims that were gotten together and worked as a company, the name of "Anaconda" was applied to the Company which secured these claims, and has thus been continued through various stages of the incorporation to the present time.

C. J. KELLEY,
President Anaconda Copper Mining Company.

New York, December 23, 1921.

BUSINESS PICKING UP

To the Editor of THE METAL INDUSTRY:

Business has picked up in our regular hardware products to such an extent that it is taking our entire efforts, time and money to get tooled up and in shape to take care of the orders which are coming along on new items we have placed on the market in the last six months.

NEW STANDARD CORPORATION,
C. J. SCHIEMER, Vice-President.

Mount Joy, Pa., December, 1921.

THE CALL OF BRASS

To the Editor of THE METAL INDUSTRY

I have returned to the brass business, after two years in the grocery business. I am now with the Michigan Copper and Brass Company, Detroit, and would feel quite out of tune without your publication, as I was for years one of your old subscribers.

JOHN A. SINNOTT.

Detroit, Mich., December 15, 1920.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research }

ELECTRO STRIP

Q.—What is a good formula for an electro-strip for nickel, brass or steel?

A.—An electro strip should be prepared as follows:

Sulphuric acid, 66 degrees	9 pints
Water	1 pint
Glycerine	1 ounce

A lead lined tank is preferable to hold the solution. However, the seams should be burned in, not soldered. On a small scale a good-sized glazed earthen ware crock may be used (such as used for acid dips). The current must be just the reverse of that used for plating.

The articles to be stripped become the anode. Copper, lead or carbon may be used as the cathodes, which should entirely surround the articles to be stripped, so that an even reduction will result.

Use 5 to 6 volts and a good strong current.

The strip will remove copper, brass, nickel, silver, etc., from brass or steel with excellent results.—C. H. P. Problem 3,023.

GLUE PATTERNS

Q.—Can you tell me of any way to make a positive glue pattern by casting glue into glue.

A.—I do not know of any way to make a glue pattern that will be a positive, by glue-into-glue casting.

I would suggest, however, that for under cut work you make a regular mold in plaster. Take care to have about 3" of wall surface. The pattern should be removed and the face of the pattern coated with soft soap, beaten like one would an egg. This can be done by allowing the soap to dissolve in a little water. Apply this with a brush. The mold should be clamped together and a mixture of wax (2 parts wax, 1 part rosin) poured in. The temperature when pouring should be such that one's finger can be put into the mixture without burning. The plaster mold should be soaked in water until no more water will be taken up. By this method, it is possible to turn out perfect wax patterns every five minutes. I have never tried glue, but that may work equally well.—W. J. R. Problem 3024.

GOLD RECOVERY

Q.—I put about 15 pennyweight of gold in about a gallon and a half of sal-ammoniac solution, by mistake. How can I recover it?

A.—There are only two ways out of your problem of recovering 15 pennyweights of gold that accidentally were added to a gallon and a half of sal-ammoniac solution.

We presume the gold was in the form of chloride or fulminate.

Add sodium cyanide to hold the gold in suspension, and then add zinc dust or shavings until all the gold is reduced from the solution. The zinc dust or shavings reduce the gold to the metallic form. Afterwards the zinc can be dissolved from the gold by the use of hydrochloric acid forming zinc chloride in solution. The gold spangles can be readily filtered from the acid and may be re-dissolved. The electro method could be used. The solution is made up with cyanide as outlined. Use carbon as the anode and sheet zinc as the cathode. Use two or three volts and a good current density. The gold will deposit out in a short time. As the cyanide decomposes a little more should be added. Until all the gold is reduced some water will be required to keep up the original amount in solution.

It is also possible that you could boil down the gold and sal ammoniac solutions until on cooling it becomes a salt. Then melt the entire mass in a small graphite crucible until the gold is reduced to the metallic form. Some boracic acid may be required for fusion.—C. H. P. Problem 3025.

LEAD-COATING BRASS

Q.—I have some brass castings for auto batteries I want to coat iwth lead, can you give me any information through your magazine shop problems how to do it?

A.—Lead can be readily deposited upon brass castings if the castings are clean and free from sand and prepared as for nickel plating. Either a simple solution of caustic soda and lead acetate, or an acid solution of lead fluorborate, will give the desired results. For heavy deposits the acid solution is preferable.

Solution No. 1 (Alkaline).

Water	1 gal.
Caustic soda, 74/76%	27 ozs.
Lead acetate, crystallized	9½ ozs.
Powdered rosin	¼ to ½ oz.

Temperature, 180 deg. Fahr. Voltage, 2.

Solution No. 2 (Fluorborate).

Water	1 gal.
Hydrofluoric acid, 40%	2 lbs.
Boracic acid	12 ozs.
White lead, dry	1 lb.
Transparent glue	¼ to ½ lb.

Temperature, 70 to 80 deg. Fahr. Voltage, 2 to 3.

Agitate the solution slightly to liberate the hydrogen bubbles that cling to the work.

To prepare the solution dissolve the hydrofluoric and boracic acids in a part of the water at 140 deg. Fahr. Mix the white lead with a little water to a plastic state, and then add the mixed acids by constant stirring. Use anodes of pure sheet lead.

You can also use a lead fluosilicate solution, which can be obtained from the U. S. Metal Refining Company, East Chicago, Ind.

The solution is a by-product of the electro-refining of lead. It may be used as purchased or reduced with water to 25%.—C. H. P. Problem 3026.

LIGHT BRASS CASTINGS

Q.—We are having considerable trouble in manufacturing brass castings, that is, in obtaining fairly smooth castings on light work such as used on electric fixture turnings.

We are using No. 1 Albany sand and it seems the castings are pitted and rough, and would ask if you can suggest any special sand or parting to be used in making these light castings in yellow brass.

A.—We do not think that your trouble is in the sand, but it may be attributed to any one of a number of causes. The trouble may be due to over-oxidation. Yellow brass is difficult to cast. The pitted surface of which you speak may be caused by zinc oxide entering into the mold. The method of overcoming the difficulty is to pour, so that the gate is kept full while pouring. Ramming too hard, or a mold made of sand that is too close, which will not allow the gas to come off freely, will cause this trouble. No. 1 Albany sand will produce a smooth casting. However, we would suggest the addition of 25% No. 2 Albany sand to be added to your No. 1. This will cause the sand to vent freely and prevent scabbing. It is a mistake to assume that fine sand makes fine castings. In other than light chandelier work, the sand for your class of work should be open enough to vent freely. Do not ram the mold too hard and use the sand as dry as consistent for molding. Dust the mold with a good grade of flour and blow it off clean. Pour the mold, not too hot, but keep the gate full. Flour is as good a facing for a nice surface as anything that we know of, for yellow brass casting. —W. J. R. Problem 3027.

MAKING MOLDS BY IRON DEPOSITION

Q.—Can iron molds be made by electro-deposition?

A.—It is possible to make molds by electro-deposition of iron, but this requires much experience and knowledge of electro-depositing metals for success. If plasters be used in the outline of the molds, it will have to be properly prepared.

1st. Dry carefully to eliminate moisture.

2nd. Coat with two or three coats of alcohol orange shellac, drying thoroughly again.

3rd. Apply either the finest powdered graphite or copper bronze powder, which could be mixed with a collodion lacquer and sprayed upon the surface of the plaster mold.

4th. Plate the copper bronze or graphite surface with copper for a short time to give the desired basic surface for the iron deposit.

5th. Use a copper sulphate solution for copper plating, such as used by electrotypers.

6th. Plate in an iron solution prepared according to the formula given in the article on the Electro-Deposition of Iron, by W. E. Hughes in the October issue of THE METAL INDUSTRY, which is as follows:

Ferrous chloride	450 gms. (16 ozs.)
Calcium chloride (anhydrous)...	500 gms. (18 ozs.)
Water	750 c. c. (⅛ gal.)

When a deposit of iron of sufficient thickness has been formed, the copper deposit can readily be dissolved with nitric acid or removed electrically by the aid of a sodium cyanide solution.

We may be able to give further data when we know just what you are trying to accomplish.—C. H. P. Problem 3028.

MILK RESISTING ALLOY

Q.—We are making a faucet for measuring milk and use the following alloy:

55 lbs. copper.
30 lbs. zinc.
6 lbs. lead.
10 lbs. nickel.
2 ozs. aluminum.

This alloy is very good for machining but we find that in use of the faucet there appears black spots on the surface of the milk.

Can you account for this and what would you suggest to use to overcome this fault.

A.—The black spots on the surface of the milk are probably due to small amounts of milk remaining in the faucet after use. This would develop lactic acid that would dissolve out the lead of the alloy especially if it were at all segregated and the film thus formed would be washed off into the milk the next time it was used.

Washing out the spigot thoroughly every time it is used would be the logical remedy for the trouble. In order to minimize the segregation of the lead, melt the copper, raise to a high temperature, add the nickel and then the zinc and next the lead. Have the lead in small pieces and stir thoroughly after adding each piece. Add the aluminum last.—J. L. J. Problem 3029.

SAND BLAST BRONZE FINISH

Q.—I have a large amount of small castings, that require a sand blast-statuary bronze finish to match the sample enclosed. The sample is of yellow brass and the castings that are to be furnished are regular bronze (copper 61%, Red metal 30%, tin 6% and lead 3%). I am having trouble to match this color on the castings.

A.—I am afraid that you will not get the desired finish with a dip. However, the first dip for this class of work is said to be: Nitric acid, 36%; yellow aquafortis, 2 gallons; sulphuric, 66%; oil of vitrol, 1 gallon; common salt, 8 ounces; sulphate of fine white coppers, 1 to 5 lbs.; lactic acid, 8 ounces to 5 gallons of solution. This mixture should be prepared the day before using. Add the oil of vitrol to the aquafortis, then the salt, a little at a time, after which add the sulphate of zinc. Then add the lactic acid, which is said to aid the finish.

Another formula that is in use for dip work consists of: Aquafortis acid 38%, one gallon; oil vitrol 66%, one gallon; rock salt, 8 ounces; water ½ gallon. The mixing is done in the same way as the first formula.

However, if you desire to produce a sand blast statuary bronze finish, the proper method should be followed, which is as follows: (This is a plate job). The articles should be acid dipped then immersed in a hot solution of sulphurite of potassium and ammonia, consisting of 2 ounces of the former and 1 ounce of the latter to each gallon of hot water maintained near the boiling point. Immerse the articles for a few seconds or until they are of a brownish-black color. Remove, wash and immerse in a diluted solution of muriatic acid, one acid to twenty of water. This will set the color. Now dry out and scratch brush dry again. Pass the article rapidly through the solution; dry out and sand blast to produce the desired tone, then lacquer to produce the desired tone; the lacquer with the usual transparent lacquer. This promotes the finish you desire.—W. J. R. Problem 3030.

SOLDERING IRON MATERIAL

Q.—Under separate cover we are sending you the tip of a soldering iron which you will note has been eaten away in the operation. This operation consists in smelting together two layers of pure tin with flux, and the soldering iron. After fifteen or twenty minutes' continuous use, the tin or its agents eats its way into the soldering point as shown.

Can you suggest any other metal or alloy which will not be affected by this action, or can you refer me to any person who might enlighten me upon the subject.

A.—The ordinary soldering iron, such as the sample submitted, is made of pure rolled copper bar forged to the desired shape. Ordinary half and half solder (50% lead, 50% tin), will corrode such a soldering iron rather slowly, but pure tin will corrode it rapidly. The tin alloys with the copper, eating it away very quickly, so that a considerable portion of the time of the workman doing the soldering is consumed in filing the tip of the soldering iron. If the soldering iron is not overheated, it will be eaten away much less rapidly.

A better plan is to make the soldering iron from a bar of pure Norway or Swedish wrought iron. Such a soldering iron will not hold its heat quite as well as a copper soldering iron, but it will take the tin quite well and not require much filing to keep the tip in good condition.—J. L. J. Problem 3031.

SPOTTING OUT

We have had some trouble with bright dipping thin brass castings for some years, and as subscribers to your magazine, are taking advantage of your Question Department to see if there is a remedy which we have not tried.

We use the ordinary bright dip—2 parts conc. sulphuric and 1 part conc. nitric—with a little salt. The castings, after rinsing, are dipped in cyanide and rinsed. During warm, humid weather, black spots appear from the minute flaws in the casting. Sometimes these appear in a few hours and sometimes longer. Baking after drying does not prevent them. We know it comes from the acid absorbed in the flaws, but as we do not have the trouble in winter, feel that there may be some remedy.

A.—Your trouble is similar to "spotting out," which is very common in the electroplating industry.

In electroplating spotting out very seldom occurs in the dry weather of winter, but is very troublesome during such weather as we have had this present summer.

There is nothing wrong with your method, but the acids or alkalis that become occluded in the minute flaws of the castings must be diluted, or neutralized, so that they will not become hydroscopic and absorb moisture from the humid atmosphere. Even when the finished product is lacquered, spotting out occurs.

Cream of tartar is an unusually good neutralizer. We would suggest that you maintain a special bath of boiling hot water, to which add about 1 ounce of cream of tartar per gallon of water. After your brass castings have been acid dipped, thoroughly washed in cold and boiling water, and vice versa, immerse them in the boiling cream of tartar solution for a short time. Rinse finally in clean boiling water, and then dry out as usual by the aid of heat, preferably in excess of 212 deg. Fahr., so that the moisture may be entirely evaporated from the flaws in the metal.

Tartaric acid could be used in the place of the cream of tartar, but not more than ¼ ounce per gallon of water should be used.

The method as outlined should overcome your trouble.—C. H. P. Problem 3032.

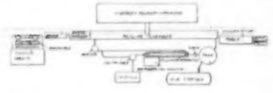
PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

1,392,462. October 4, 1921. **Manufacture of Alloys.** Henry Livingstone Sulman and William Bowman Ballantine, of London, England.

This invention relates to improvements in the manufacture of alloys, and is a modification of the process which consists in adding to a mixture of compounds of the metals to be alloyed, such, for example, as oxids, a quantity of aluminum powder or other thermo-reducing agent and igniting the mixture to reduce the compounds to metallic form.

1,392,781. October 4, 1921. **Apparatus for Pickling Metal Articles.** Henry S. Marsh and Ralf S. Cochran, of Youngstown, Ohio.



An apparatus for pickling sheet metal means for projecting laterally a succession of sprays of pickling solution and means for sustaining a sheet of metal in vertical position and for causing it to advance through such succession of sprays, substantially as described.

1,393,388. October 11, 1921. **Alloy.** Foster Milliken, of Lawrence, New York, assignor to Foster Milliken, S. Fullerton Weaver and James M. Repplier, as trustees.

The object of the invention is to provide a new and improved alloy capable of being rolled drawn, forged or worked in other ways while being cold, to form rods, plates, sheets, wires, tubing and the like.

An alloy made from the following metals in substantially the following proportions, namely:

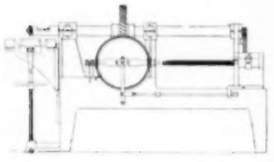
	Per cent.
Copper	60 to 70
Zinc	19 to 24
Nickel	9 to 12
Iron	1 to 2½
Manganese copper	1

1,393,290. October 11, 1921. **Treatment of Metals and Their Surfaces.** Bela A. Keller, of Newark, N. J. assignor of one-third to Marion E. Messersmith, of Newark, N. J., and one-third to Moses E. Stern, of New York, N. Y.

This invention relates, generally, to improvements in the are of applying to a base of metal a non-metallic covering, consisting essentially of a combination of celluloid, or analogous material and acetone the mixture being suitably colored, and applied to the surface of the metal base, said surface having been previously treated with a composition of shellac, denatured alcohol and ether.

1,392,937. October 11, 1921. **Metal-Working Machine.** Oran S. Hammagren, of Minneapolis, Minn.

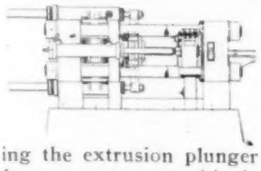
This invention relates to metal working machines. An object of this invention is to provide a machine in which a grinding wheel may be rotated at a high rate of speed and at the same time given not only a slow longitudinal reciprocatory motion but also a planetary motion. Another object is to provide means for changing the extent of the planetary motion whenever desired. Another object is to provide a machine which may be readily changed for use either as a grinding machine or for use in boring, drilling, etc.



1,394,534. October 25, 1921. **Heat Treatment of Aluminum Alloys.** Earl Blough, of Parnassus, Pennsylvania, assignor to Alumium Company of America, of Pittsburgh Pa., a corporation of Pennsylvania.

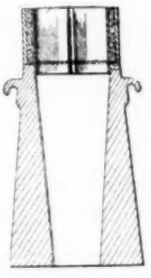
This invention relates to the heat treatment of aluminum alloys, and the chief object of the invention is to provide a simple and easily worked method of treatment for the purpose of improving the important physical properties of hardness and tensile strength, especially the latter.

1,393,579. October 11, 1921. **Metal-Extrusion Press.** Frederick George Schranz, of Philadelphia, Pa.



This invention relates to apparatus for extruding rods, tubes, and the like, from solid metal, usually heated billets of non-ferrous metal, and one object of the invention is to provide simple and efficient means for readily moving the extrusion plunger in both directions; into and away from engagement with the billet from which the rod or tube is extruded.

1,394,415. October 18, 1921. **Feeder for Ingot-Molds.** Bloomfield H. Howard, of Washington, D .C., and Ernest J. Turner, of Pittsburgh, Pa.

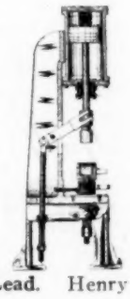


This invention is to provide a feeder for ingot-molds which keeps the upper end of the ingot in a heated state and practically eliminates blow holes or cavities or what is known as piping in the upper portion of the iron or steel ingot and also prevent segregation and thus produces an ingot homogeneous throughout in both structure and material.

1,394,246. October 18, 1921. **Die-Casting Ejector.** Baltzar Emanuel Bolling, of Racine, Wis.

It is one of the objects of the present invention to overcome the before mentioned objectionable features and provide a die-casting ejector which will exert an equal strain upon different portions of the casting in ejecting it from the mold part and thus eliminate the larger part of the breakage and increase the capacity of the casting machine. A further object of the invention is to provide a die-casting ejector in which means are provided for positively positioning the ends of the ejector pins with relation to the recess of the molding die to prevent the marring of the casting by said pins.

1,394,561. October 25, 1921. **Die-Casting Machine.** John C. Kopf, of Bellevue Borough, Pa.



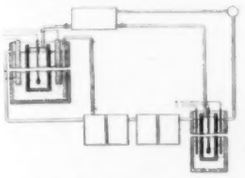
A die-casting machine, comprising a frame, a plunger, and means for operating the same, in combination with a receptacle from which the metal is forced by the plunger into the die, vertical guides and lifting springs for the receptacle, and means whereby descent of the plunger overcomes said springs and causes the receptacles to seat on the die.

1,395,820. November 1, 1921. **Dezincing Lead.** Henry Harris, of London, England.

It has been found that a fused alkali chloride will react with molten lead containing zinc to remove the latter from the lead. The temperature required, however, is so high that loss of lead occurs and alkali metal passes into the lead, from which it cannot easily be eliminated.

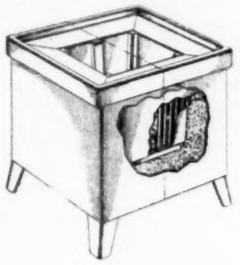
This invention consists in avoiding these objections by using in conjunction with the alkali chloride a substance or substances which reduce its melting point. Preferably the melting point of the reagent thus formed should not exceed 500 deg. C.

1,395,827. November 1, 1921. **Separating Metals by Electrolysis.** Noak Victor Hybinette, of Christiania, Norway.



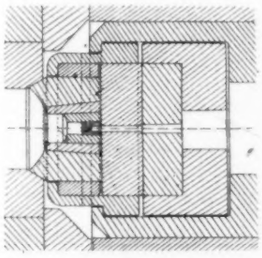
The process of plating metals upon a cathode which is separated from the anode by a filtering diaphragm, which comprises effecting a flow from the cathode to the anode of an electrolyte which enters the cathode compartment with an excess of free sulphuric acid beyond the amount to be tolerated at the depositing surfaces of the cathode; substantially as described.

1,394,954. October 25, 1921. **Metal-Melting Pot.** Tycho Van Aller, of Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.



An electrically heated melting pot, comprising a receptacle for the material to be fused and a heating unit in good thermal relation therewith, having such a positive temperature coefficient of resistance that a constant working temperature is maintained regardless of the working condition within the pot.

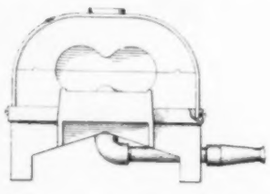
1,395,217. October 25, 1921. **Cascade Extrusion-Die for Cold or Hot Spinning of Metals.** Louis Hippolyte Edmond Begot, of Paris, France.



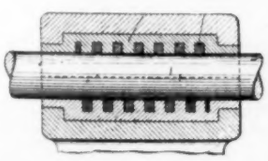
This invention relates to an extrusion-die in cascade, by means of which can be obtained in a single operation a single shape or tube in one piece, containing the whole of the metal of the ingot and the diameter of which can be as small as may be desired compared to the original ingot, without the critical point being able to come into action, that is to say, without any change taking place in the mechanical properties and constants of the metal.

1,397,178. November 15, 1921. **Soldering-Iron Heater.** Joseph Needham, of New York, N. Y.

This invention relates to soldering iron heaters and particularly to apparatus of this class designed to be used in workshops or other manufacturing institutions, and the object of the invention is to provide a heater of the class and for the purpose specified in which high pressure fuel gas is preferably employed as the heating medium; a further object thereof being to so construct the heating apparatus as to maintain an even degree of heat and to equally distribute the flame discharged into the heater; and with these and other objects in view the invention consists in an apparatus of the class and for the purpose specified which is simple in construction and operation and efficient in use.



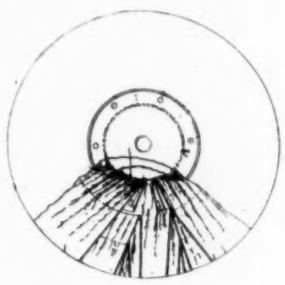
1,398,219. November 29, 1921. **Bearing.** Edward Goodrich Acheson, of Niagara Falls, N. Y.



A bearing of the character specified, comprising a body of alloy, and an inlay of vulcanized fiber impregnated with graphite the alloy being cast around the inlay, with the bearing surface thereof substantially flush with the bearing surface of the inlay.

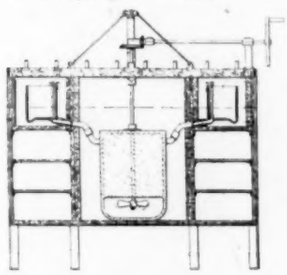
15,226. November 15, 1921. **Buffing or Polishing Wheel.** Alexander Levett, of New York, N. Y., assignor to Benjamin D. Riegel, Trustee, of Fairfield, Connecticut.

The invention relates to buffing or polishing wheels made of cotton, wool, leather or other material, and its object is to provide a new and improved buffing or polishing wheel arranged to prevent the loss of the material of which the wheel is made and to permit of using the wheel until the material is worn away, practically down to the hub or center piece. Another object is to provide a buffing or polishing wheel which is exceedingly strong and durable and which can be cheaply and quickly manufactured with a minimum amount of material.



1,396,374. November 8th, 1921. **Electric Furnace.** Walter Lohrey, of Bloomfield, N. J., assignor to Magna Metal Corporation, of New York, N. Y.

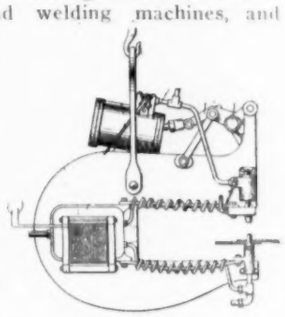
The present invention is a furnace designed primarily for the alloying of metals.



In alloying magnesium and certain other metals, special precautions must be taken to prevent oxidation and "burning" of the metal. It is to this feature this invention is particularly directed, one of the principal objects of the invention being to protect the metal both in the melting and in the subsequent alloying stages from the destructive effects of oxidation.

1,398,028. November 22, 1921. **Process and Apparatus for Working Metals.** Frank P. Kobert, of Amityville, N. Y., assignor to Kobert Machine Company, Inc., of New York, N. Y.

This invention relates to metal working machines such as heating, re-heating, riveting and welding machines, and this invention consists in the introduction of an electric apparatus whereby a new apparatus or machine is produced, and a new method or process of operation performed in the working or fashioning of metal, and the object of my invention is to provide a simple, practical and efficient process and apparatus for accomplishing the desired result.



1,398,520. November 29, 1921. **Apparatus for Use in Annealing or Otherwise Treating Metals.** Alfred Howgate, of Riddlesden, Keighley, England.

To produce "pans" of such a formation or construction as will permit their exposed outer surfaces better to withstand the actions of heat and therefore to prolong the effective usefulness of said "pans," is the object of my present invention. My invention relates to apparatus for use in the manufacture of malleable iron and in like processes wherein iron vessels or containers known as "pans" are employed for receiving the articles to be treated.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

NEW BURNISHING BARREL

The Abbott Ball Company, of Hartford, Conn., has placed on the market a new type of burnishing machine.

The one big feature which it is claimed makes this machine entirely different from any burnishing barrels on the market is that instead of the articles to be finished being put into the barrel loosely and allowed to tumble in a mixture of balls, soap and water the work is held stationary to the inside of the barrel body and is carried by it through the mixture of balls, soap and water. In this way large work can be finished without any danger of one piece of work coming in contact with another and bruising or scratching it.

The barrel body is eight-sided, and has a hinged hand hole cover on each of the eight sides. The edge of the opening in te barrel body proper is on an angle of 45 degrees. There is a part, No. 19, that sets in on this opening and is held down in place by the cover coming against two flat springs. These springs also act as handles to lift this part out. On the face of this part there would be a fixture made to hold the class of work desired to finish.

Figure 1 shows barrels fitted up for finishing parts of hack saw frames, sample of work shown underneath the barrel.

These machines are designed for manufacturers who have large quantities of one or more classes of work to finish, and in operating the machine they have two or three sets of part No. 19 with fixtures on them for each class of work. In operating the machine while unloading one set of fixtures and putting a new batch of work into them the machine would be operating on a set in the barrel, and when the work is finished instead of dumping the balls from the barrel, as is done in other style of barrels, he would merely open up the cover that is on the top, lift out the fixture with the work on it, put another fixture with unfinished work on it in, close the hinged cover, then bring the next hole up to the top and repeat the operation until he had the finished work all out of the barrel and the new batch of work in.

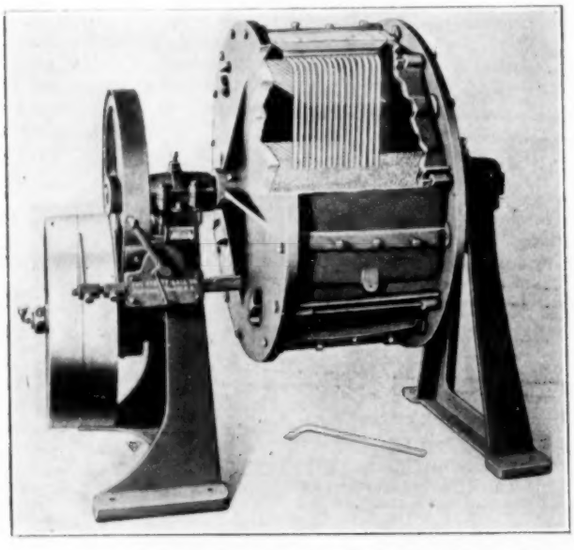


FIG. 1. BARREL FITTED FOR FINISHING HACK SAWS.

It will also be found to advantage on work that is to be plated, that by having three sets of fixtures when the work comes out of the barrel ready to be plated it is left right on the fixtures, put through the plating operation and brought back to the burnishing barrel for its final finishing after plating with the one loading operation of the fixtures.

Figure 2 shows the method for holding the hinged cover back and also shows a cover that is fitted up with wire cloth underneath the plate with the large holes in it and the inside of part No. 19, this part being drilled full of holes. This cover as shown is a special strainer cover. This wire cloth is the proper mesh and will not allow any of the balls to get out. The purpose of this strainer cover is to make it easy to keep the inside of the barrel and balls clean, as in ball burnishing it is necessary to keep the contents of the barrel very clean, and if there is any dirt which gets carried along with the work into the barrel it is found necessary to rinse it out so that with this strainer cover the barrel can be opened up, filled with water, put this strainer cover on and let the barrel run so as to rinse it out.

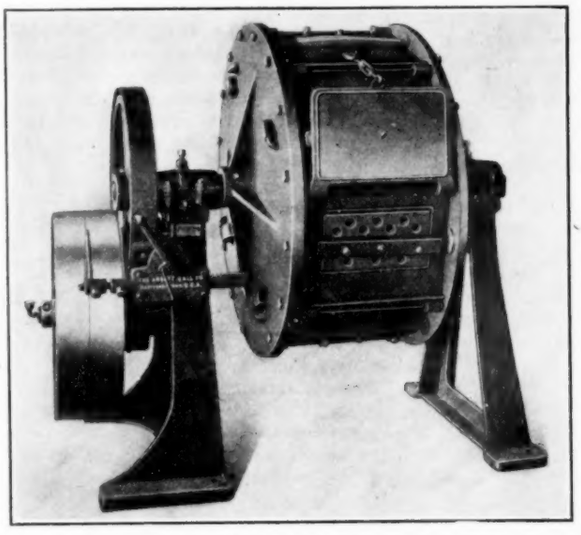


FIG. 2. VIEW SHOWING METHOD OF HOLDING HINGED COVER BACK.

NEW FURNACES

Several new types of furnaces have been placed on the market by Palo Company, 153 West Twenty-third Street, New York. The Meker furnace, built in various styles and for various purposes are featured.

MEKER HIGH TEMPERATURE CRUCIBLE FURNACE

This type is designed for nickel, gold, silver, platinum, iron and all other metals and alloys having melting points of not more than 1750° C, which is the maximum temperature of the furnace. In order to meet the demands and resist high temperatures a special refractory material made from French clays is used for linings which are constructed very heavy for durability. The linings are encased and protected by heavy sheet iron. The rolling cover is provided with opening in center for escape of gases or insertion of thermo couple.

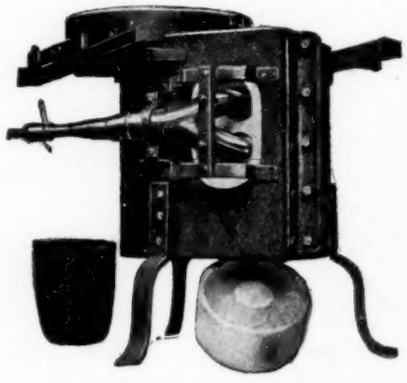


FIG. 1. HIGH TEMPERATURE CRUCIBLE FURNACE.

Several sizes are manufactured taking crucible varying from 3¼" dia. x 3¼" high to 12" dia. x 16" high. The small furnaces are heated by one Meker burner, whereas the larger ones are

heated by two or more Meker burners, depending upon size and consistent with economical operation. The flame does not heat the crucible at one point but instead is given a circular motion and thus heats the crucible on all sides permitting a uniform melt and increased efficiency.

MEKER HIGH TEMPERATURE MUFFLE FURNACE

The same refractory material is used in this high temperature muffle furnace as in the furnace described above. It is manufactured in various sizes, taking muffles up to 14" wide, 6" high and 25" deep.

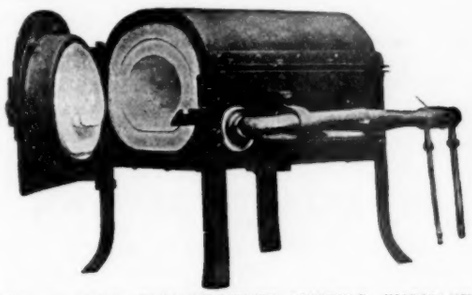


FIG. 2. HIGH TEMPERATURE MUFFLE FURNACE.

The number and size of Meker burners furnishing the heat is determined by the size of furnace. The muffles are of oval shape on the outside, and the flames are directed around the muffle instead of heating it in one place. This construction results in a more uniform temperature. It is especially used for annealing, enameling, cupelling, assaying and all other work requiring temperatures of not more than 1650° C.

MEKER MODEL C CRUCIBLE FURNACES

Model C crucible furnace meets the demands for a low temperature furnace for brass, copper, alloys, etc. Three types are manufactured as illustrated. Figure 1 is for experimental and laboratory work, and is made in two sizes. Figure 2 will melt 5 lbs. of copper in 30 minutes. Figure 3 shows the design of the larger furnaces with six or more Meker burners heating the crucible from all sides.

Air pressure is not required for operation, but the burners used are equipped with adjustable air regulators so that the flames can be properly adjusted to meet the requirements and conditions.

FIG. 3. CRUCIBLE FURNACE.

GRINDING AND POLISHING MACHINES

The Saint Louis Machine Tool Company, 932 Lougborough Ave., St. Louis, Mo., has put out a new line of grinding and polishing machines.

Figure 1 shows the belted motor grinding and polishing machine of the stationary type. The motor is of the repulsion start, induction, single or three-phase type, fully enclosed and dust proof. Other types of motors are furnished.

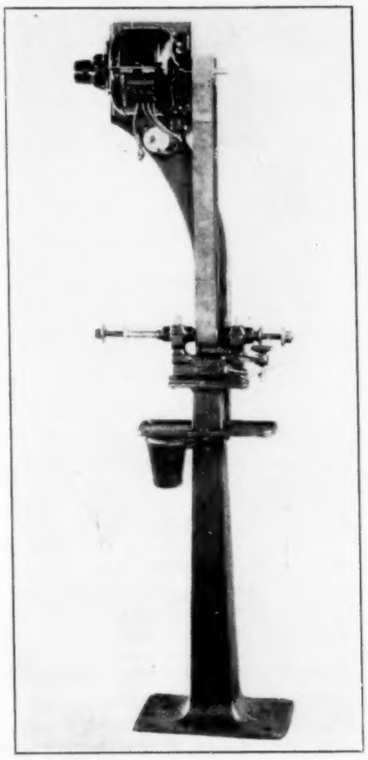


FIG. 1. STATIONARY TYPE, BELTED MOTOR.

The No. 7 Ball Bearing Polishing Machine is a new product. It is illustrated on page 10 in the article on "Modern Polishing Machines, by P. W. Blair.

The portable type machine is very useful under conditions which make it hard for workmen to go to the machines. The machine is rigid and substantial, requiring a lift of over a hundred pounds to tip it.

This machine is furnished with four deep groove ball bearings, the two outside bearings as near the wheel as possible and the inside bearings as near the pulley as possible.

The illustration shows the machine with belt guard, which is an important feature in view of the requirements of present factory inspection. When the machine is intended to be run from a countershaft overhead the handle shown is left off. When it is intended to be run with tight and loose pulleys

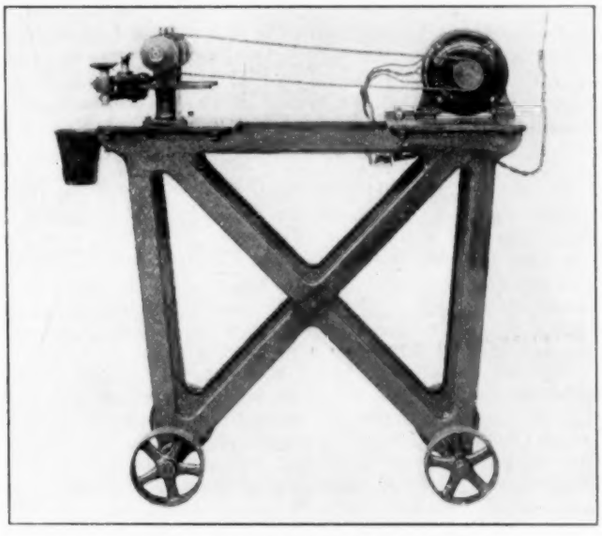


FIG. 2. PORTABLE TYPE MACHINE.

from overhead, the handle is furnished as shown. This handle engages a pinion inside the belt guard which in turn engages a rack carrying shifter fingers. One turn of the handle shifts the belt from tight to loose pulley and vice versa.

The new No. 10 "Western" overhanging Polishing Machine is claimed to be the most for the money now offered in this type of machine. It is of good substantial weight. The bearings are long and lined with a high grade of anti-friction metal and are self-oiling.

The arbors are .40 carbon steel, threads are square of extra coarse pitch.

FIG. 3. NO. 10 WESTERN MACHINE.

All machines are furnished with plain pulley for use with countershaft or with tight and loose pulleys.

NEW ELECTROPLATING SALTS

The "Sal-Hyde" plating salts are preparations in a dry concentrated form, containing pure gold, platinum, silver, plataloid, copper, bronze, zinc, brass, etc., and their combined chemicals, which it is claimed, when dissolved in water are immediately ready for use. It is also stated that "Sal-Hyde" will not deteriorate and can be dissolved in as small or as large a quantity as desired; exhausted plating baths can be replenished by adding a small quantity at any time.

For convenience of the trade, it is put up in bottles of (4) four sizes in sufficient quantity to make one quart, one-half gallon, one gallon and two gallons of solution. With the "Sal-Hyde" salts, it is claimed that the plater can do both light, medium and heavy plating, and coloring just as the needs require. It is sold by the W. Green Electric Company, 81 Nassau street, New York.

NEW METAL PRESERVATIVE

A new metal preservative has very recently been invented by J. C. Hertstein, Little Falls, N. J. It is claimed to be a waterproof, transparent coating which forms a very hard surface when applied to the various metals. The composition is secret and the inventor states that the composition is entirely new. This metal preservative can be colored to suit the same as lacquers and the inventor claims that it is far superior to any metal lacquer now on the market because of its durability and cheapness of manufacture.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METALS DIVISION

HEADQUARTERS, 29 W. 39TH ST., NEW YORK CITY

The regular Fall meeting, which is ordinarily held with the American Foundrymen's Association, has been postponed until the week of April 24th in Cleveland. This postponement was made to conform with the schedule of the A. F. A. The Winter meeting in February, 1921, was a great success. The program was carried out in good fashion, and the papers were strong and well discussed. At the next Winter meeting in February, 1922, the institute will inaugurate a series of lectures similar to those given by the Institute of Metals of Great Britain, known as their "May Lectures." The opening number of this series will be delivered by Dr. Wilder D. Bancroft, of Cornell University, on some subject relating to physics and chemistry as applied to metallurgy. This inauguration of a series of lectures given by the best talent in the country should be a decided step in advance.

The last Non-Ferrous Volume of the A. I. M. E. was a very valuable contribution to the Non-Ferrous Alloy literature. It contained a number of valuable and instructive papers, and was edited in first class shape. At a recent meeting of the executive committee of the division, which was attended by over twenty men, strong emphasis was placed on the quality of our program, and every effort will be made to secure the best papers pertaining to non-ferrous alloys that it is possible to obtain. The division is in strong healthy condition, and with the return of normal business conditions should be largely increased in membership.

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 S. DEARBORN ST., CHICAGO, ILL.

Due to delays which have occurred it has been decided to hold the coming convention during the week of May 22, instead of April 24.

AMERICAN ELECTROCHEMICAL SOCIETY

HEADQUARTERS, DR. COLIN G. FINK, 101 PARK AVE., NEW YORK CITY

The American Electrochemical Society has had a very successful year. At the Spring meeting, which took place at Atlantic City, two sessions were devoted to the subject of Corrosion. cheaper and better by electro-chemical or electro-thermic methods devoted years of study to this important subject took part in the discussion, and many new phases were brought out.

The Fall meeting was held at Lake Placid, and was one of the most successful meetings of the society. The greater part of the technical sessions was devoted to a discussion of the electric furnace applied to the non-ferrous metal industries. The introduction of electric furnaces into the brass industry has brought about a most phenominal development. There are today more than a dozen different types of electric brass furnaces, each one of which having some distinctive feature and points of advantage. Papers were presented by Mr. Bailey, of Alliance, O.; Mr. H. M. St. John, of the Detroit Electric Furnace Company; Mr. E. A. Smith, representing British brass industry and many others.

The plans for the coming year are pretty well formulated. The society will meet at Baltimore, April 27, 28, 29. Mr. William H Boynton, of Baltimore, is chairman of the local committee, and a very attractive program has been assured. The topics to be discussed at the technical sessions include cast iron made in the electrical furnace, "Gases of the Electrochemical Industries," and a third and more theoretical topic, "Electromotive Chemistry."

It is interesting to record that in spite of the depressed business conditions throughout the country, the society has lost fewer members in proportion than any other technical society. Interest in electro-metallurgy and electro-thermics is rapidly increasing and many factories, foundries and manufacturing plants that a few years ago looked upon electric furnaces, electrolytic cells, electric heat treating ovens, electrical precipitators, etc., as laboratory pieces of apparatus, consider same today absolutely essential fixtures. Various metallic products can be made and treated cheaper and better by electric-chemical or electro-thermic methods than can be treated or made in any other way.

The New York section of the society held a memorial meeting in memory of our late secretary, Dr. Joseph W. Richards, in Rumford Hall, New York City, on Wednesday evening, November 16. Dr. C. A. Doremus, chairman of the New York section, occupied the chair during the meeting. Speakers were President

Smith, H. C. Parmelee, Dr. Carl Hering, ex-President Walter S. Landis, William Richards and Dr. Florence H. Richards.

BRASS MANUFACTURERS

HEADQUARTERS, CARE W. M. WEBSTER, CITY HALL SQUARE BLDG., CHICAGO, ILL.

At the recent meeting of the National Association of Brass Manufacturers regular business was taken up and disposed of, including reports by committees on trade extension, water works goods, plumbing supplies and others. These committees are doing excellent work in standardizing, eliminating unnecessary types and in getting closer co-operation between the manufacturer, jobber and retailer in reaching the public.

The question of taking large orders for far-off deliveries was discussed, and the members cautioned against this practice, due to the number of cancellations in the past.

The next meeting will be held in Cleveland, March 7, 8 and 9, 1922.

NEW YORK BRANCH, A. E. S.

HEADQUARTERS, CARE E. HAAS, 504 E. 163RD ST., NEW YORK CITY

FOUNDER'S DAY

The American Electro Platers, Society was organized March 6, 1909, at the Hotel Chelsea, New York City. In June of the same year it was granted a charter by the State of New York under the name of the National Electro Platers' Association of the United States and Canada.

When the Supreme Society was formed, the mother society became a branch and is now known as the New York Branch of the American Electro Platers' Society, and since then twenty-three branches have been formed, twenty-one in the United States and two in Canada. Including the mother branch there are twenty-four branches in all.

In honor of Charles H. Proctor, the founder of the Society and thrice president of the mother branch, a committee appointed by the New York Branch has deemed it an appropriate and befitting testimonial of his work as founder, to designate the third Saturday of February in the year of 1922, and each succeeding year to be known as Founder's Day. On the evening of this day and each year thereafter the annual banquet of the New York Branch will be held. In the afternoon preceding the banquet an open session will be held and all electro platers are invited to attend—members or non-members. At this open meeting papers of interest will be presented to the platers and the industry at large and discussions will follow. The motto of the society is "Knowledge is Power" and only by personal contact and intercourse with the men who are interested in the art and by the dissemination of knowledge so gained through the Society's Monthly Review, can the New York Branch and the society at large grow and fulfill its obligations to its votaries, the electroplating industry and also to its founder.

In honor of this event and for all future years, the New York Branch of the American Electro-Platers' Society extends a cordial and hearty invitation to all electro-platers in every branch of the industry, as well as to manufacturers, managers, superintendents and chemists, to be present and participate in the educational features and discussions of the Founder's Day open session, and also the banquet, which will be the thirteenth of this branch, at the Aldine Club, 200 Fifth Avenue, New York City. Information and tickets can be obtained from John Burke, 110 Glen street, Brooklyn, N. Y.

SOCIETY FOR TESTING MATERIALS

HEADQUARTERS, 1315 SPRUCE ST., PHILADELPHIA, PA.

The field of non-ferrous metals is covered in the society by two committees; our committee on copper wire and our committee on non-ferrous metals and alloys. The work that has been accomplished during the past year was reported by these two committees at the last annual meeting of the society. As a result of the recommendations of the committee on copper wire a specification for tinned soft or annealed copper wire for rubber insulation was advanced to standard.

The committee had also made a study of the testing of wires that had been unwound from cable and straightened. As a result of this study the committee advises that the attempt to unwind or straighten hard or medium hard wire removed from cable so distorts and deforms the wire as to amount to actual damage. Tests made on such deformed wires yield no useful indication either of the properties of the cable or of the wires forming the cable. The committee therefore recommended that the Standard Specifications for bare concentric-lay copper cable be revised to include the provision that the tests for the physical and electrical properties of the wires composing cables made from hard drawn or medium hard drawn wire may be made before but not after stranding. Tests on annealed or tinned soft copper wire, however, may be made on wires removed from the cable.

Our committee on non-ferrous metals and alloys submitted new tentative specifications for nickel. It also submitted new tentative methods of chemical analysis of aluminum and light aluminum alloys and also chemical analysis of nickel. The committee advanced to standard the following tentative specifications:

For bronze bearing metals for turntables.
For bronze bearing metals in ingot form.
For sheet high brass.
For solder metal.
For light aluminum casting alloys.

The tentative methods of chemical analysis of alloys of lead, tin, antimony and copper were also advanced to standard after a slight revision had been made in the wording of the determination of lead. The committee also submitted revisions of the specifications for brass ingot metal for sand castings so as to make these specifications applicable to both graded and ungraded ingot metal. The tentative specifications for non-ferrous alloys for railway equipment were also revised so as to include requirements for phosphor bronze.

The committee now has before it for consideration a revision of the tentative specifications for pig lead so as to provide separate chemical requirements for low bismuth corroding lead and high bismuth corroding lead. A revision of the elongation requirements in the standard specifications for copper plates for locomotive fire boxes and for copper bars for locomotive stay-bolts is also under consideration. A subcommittee is engaged upon a study of nomenclature of the various non-ferrous alloys. It will probably be in a position to report at the next annual meeting of the society. A second subcommittee expects to take up a study of compression tests.

C. L. WARWICK,
Secretary-Treasurer.

MOLDING SAND RESEARCH COMMITTEE

HEADQUARTERS, CARE PROF. ROBT. E. KENNEDY, 909 W. CALIFORNIA ST., URBANA, ILL.

The Molding Sand Committee recently organized under the auspices of the National Research Council and American Foundrymen's Association held an interesting meeting in the Engineering Societies Building, New York, on December 9. This was the first meeting of the whole committee.

Hundreds of thousands of tons of molding and core sands are used annually in the iron, steel and non-ferrous foundries of America. A large proportion of the expense involved is in the transportation of such sands and the handling of the same in the foundry. A little of it is reused; much more might be. Moreover, sands are not always correctly selected for specific purposes. Mixing and other treatment can secure improvement.

Under the direction of the Division of Engineering, N. R. C., and the American Foundrymen's Association, a valuable digest of literature has been made by Professor R. E. Kennedy, of the University of Illinois, and distributed to the members of the committee and others interested. Practical foundrymen regard this as a most important treatise on the subject.

Three sub-committees are actively at work. The sub-committee on Standard Tests has reached agreement on six tests which will show the properties that are most indicative of satisfactory working conditions of the sand in almost all lines of foundry practice. The "fineness" test and "cohesiveness" test were reported as the two tests which should be given first consideration. Tests for permeability, water content, and thermal properties, and rational and chemical analyses, should also be considered in a general study of molding sands. The American Society for Testing Materials is to be invited to appoint representatives on this committee to help standardize the methods of making such tests.

The sub-committee on Reclamation of Old Molding Sands and Greater Use of Old Sands in molding and core-making operations, is preparing a questionnaire for submission to the foundries, which will bring out the proportions of sands reclaimed and the methods of reclamation.

The sub-committee on Synthetic Sands will confine its attention at first to mechanical means for mixing.

Under the guidance of Professor H. Reis, of Cornell University, co-operation will be secured from State Geologists and the Director of the U. S. Geological Survey, in making a thorough survey of sand deposits in this country that are suitable for foundry use.

The co-operation of men having like interests in Canada, England, and Belgium, has been secured.

Mr. R. A. Bull, Spondly Building, 639 Diversey Parkway, Chicago, Illinois, has been elected chairman of the Molding Sand Research Committee, and Professor R. E. Kennedy, 909 West California street, Urbana, Illinois, is secretary.

WILLIAM SPRAGAGEN, Secretary,
Division of Engineering, N. R. C.

WASTE MATERIAL DEALERS

HEADQUARTERS, TIMES BLDG., NEW YORK CITY

An invitation has been received from the Navy Department by this association to send a committee to Philadelphia to take part in a conference to be held at the Philadelphia Navy Yard to-day, which conference will be participated in by steel manufacturers, bankers and many varied interests, the object of which is to consider ways and means of disposing of obsolete vessels. The committee appointed is made up of Frank C. Overton, president of the association; Harry R. DeGroat, first vice-president; Charles A. Barnes, Henry Lissberger, I. Gluelck, W. E. Perry Hitner and Charles M. Haskins, secretary of the association.

LIGHTING FIXTURE MANUFACTURERS

HEADQUARTERS, GORDON SQUARE BLDG., CLEVELAND, O.

A special fare rate has been granted by the Central Passenger Association for delegates and their families attending the Milwaukee conventions, January 30-February 4, 1922.

Be sure when purchasing your going ticket to ask the ticket agent for a certificate. Do not make the mistake of asking for a receipt. If, however, it is impossible to get a certificate from the local ticket agent, a receipt will be satisfactory and should be secured when ticket is purchased. See that the ticket reads to the point where the convention is to be held and no other. See that your certificate is stamped with the same date as your ticket. Sign your name to the certificate. Show this to the ticket agent.

Call at the railroad station for ticket and certificate at least thirty minutes before departure of train.

Certificates are not kept at all stations. Ask your home station whether you can procure certificates and through tickets to the place of meeting. If not, buy local ticket to nearest point where a certificate and through ticket to place of meeting can be bought.

Immediately on your arrival at the meeting present your certificate to the endorsing officer Mr. H. E. Brauns, as the reduced fare for the return journey will not apply unless you are properly identified as provided for by the certificate.

No refund of fare will be made on account of failure to either obtain a proper certificate, or on account of failure to have the certificate validated.

For further details and for hotel reservations or booth space at the lighting fixture market, write to Mr. Charles H. Hofrichter, secretary National Council Lighting Fixture Manufacturers, 231-233 Gordon Square Building, West Sixty-fifth and Detroit avenue, Cleveland, Ohio.

COPPER & BRASS RESEARCH ASSOCIATION

HEADQUARTERS, 25 BROADWAY, NEW YORK CITY

The first annual meeting of the Copper and Brass Research Association was held on December 6th at the offices of the association at 25 Broadway.

The following directors were elected to serve for the ensuing year: R. L. Agassiz, Calumet & Hecla Mining Co.; J. W. Allen, Greene Cananea and Inspiration; H. F. Bassett, Taunton-New Bedford Copper Co.; H. C. Bellinger, Chile Exploration Co.; Edward H. Binns, C. G. Hussey & Co.; Stephen Birch, Kennecott and Braden Copper Cos.; F. H. Brownell, American Smelting & Refining Co.; J. Parke Channing, Miami Copper Co.; F. S. Chase, The Chase Companies; Carl F. Dietz, Bridgeport Brass Co.; Walter Douglas, Phelps Dodge Corporation; B. Goldsmith, National Brass & Copper Co.; E. O. Goss, Scovill Mfg. Co.; Robt. H. Gross, East Butte Copper Mining Co.; Charles Hayden, Chino Copper Co.; U. T. Hungerford, U. T. Hungerford Brass & Copper Co.; C. V. Jenkins, Chino Copper Co.; C. F. Kelley, Anaconda Copper Mining Co.; H. B. Paull, Calumet & Arizona Mining Co.; R. M. Raymond, United Verde Extension Mining Co.; H. J. Rowland, Rome Brass & Copper Co.; A. B. Seelig, Michigan Copper & Brass; W. Parsons Todd, Copper Range Co.

The directors elected the following officers for the year 1922: President, R. L. Agassiz, president Calumet & Hecla Mining Co., 12 Ashburton place, Boston, Mass.; vice-president, C. F. Kelly, president Anaconda Copper Mining Co., 25 Broadway, New York, N. Y.; vice-president, F. S. Chase, president The Chase Companies; treasurer, Stephen Birch, president Kennecott Copper Corp.; vice-president Braden Copper Co., 120 Broadway, New York, N. Y.; secretary, W. S. Eckert, manager William A. Willis.

Mr. R. L. Agassiz, president of the Calumet & Hecla Mining Company, who is president of the Copper & Brass Research Association, authorizes the following:

At the first annual meeting of the Copper and Brass Research Association plans for 1922 were adopted after a full discussion of the situation confronting the industries. Briefly that situation is as follows:

From the early days in this country copper had been produced and fabricated on a constantly increasing scale. The age of electricity created such a demand for copper that even with vastly greater production brought about by the opening of new mines and constant improvements in mining and smelting methods the entire output was consumed.

Finally when the supreme demands of the World War were made upon the industries, copper and brass were of necessity almost entirely withdrawn from domestic uses. Domestic requirements had to be met, and substitutes consequently took the place of copper and brass in many uses.

As we view it in the new business era which is at hand we shall see a kneener competition, more scientific buying and a greater scrutiny of values in relation to price than ever before. We believe that much that has been taken on faith in the past will in the future be subjected to the acid test of past performance and inherent worth. That is as it should be. No industry can hope permanently to prosper unless it has a product which it is really economical for the public to buy.

The association is giving careful study to technical, production and sales methods in a continuing effort to reduce costs of production and distribution. The aid of new and more scientific methods is constantly being availed of and the aim of the industry will be not only to tell the public of the economy of the use of copper and brass, but to insure to the public the most advantageous possible conditions of purchase and use.

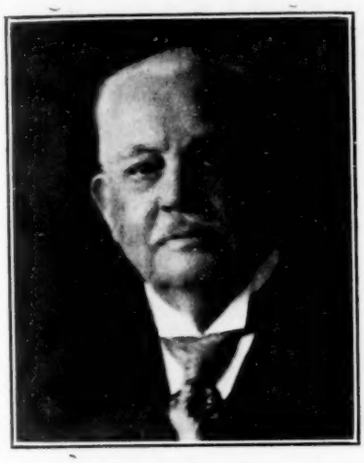
The following companies are now members of the association: American & Smelting & Refining Co., Anaconda Copper Mining Co., Arizona Commercial Mining Co., Braden Copper Co., Bridgeport Brass Co., Calumet & Arizona Mining Co., Calumet & Hecla Mining Co., Chile Exploration Co., Chino Copper Co., The Chase Companies, Copper Range Co., East Butte Copper Mining Co., Greene Cananea Copper Co., U. T. Hungerford Brass & Copper Co., C. C. Hussey & Co., Pittsburgh, Pa.; Inspiration Consolidated Copper Co., Kennecott Copper Corporation, Michigan Copper & Brass Co., Detroit, Mich.; Miami Copper Co., Mother Lode Coalition Mines Co., National Brass & Copper Co., Lisbon, Ohio; Nevada Consolidated Copper Co., New Cornelia Copper Co., New England Brass Co., North Butte Mining Co., Old Dominion Co., Phelps Dodge Corporation, Ray Consolidated Copper Co., Rome Brass & Copper Co., Rome, N. Y.; Scovill Mfg. Co., Waterbury, Conn.; Shattuck Arizona Copper Co., Taunton-New Bedford Copper Co., United Verde Extension Mining Co., Utah Copper Co., Utah Consolidated Mining Co.

PERSONALS

ITEMS OF INDIVIDUAL INTEREST

BANQUET FOR U. T. HUNGERFORD

THE METAL INDUSTRY has published portraits and careers of several captains of industry who have rounded out half a century of usefulness in the copper and brass trades. These include such figures as Charles F. Brooker, at the present time chairman of the board of directors of the American Brass Company, Waterbury, Conn.; the late Chauncey Goss, formerly president of the Scovill Manufacturing Company, Waterbury, Conn.; the late T. G. Locker, manager of Charles Clifford & Sons, Ltd., Birmingham, England.



U. T. HUNGERFORD.

In recording half a century of effort of the notables, we have also included the fifty years of service of foremen and master workmen—Messrs. Andrus, Mellish and others, who had actually been brass workers in one capacity or another for over fifty years.

In the report of the celebration of Mr. Hungerford's eightieth birthday, we have the additional pleasure of including him among the fifty-year men. For over half a century he has been a manufacturer and distributor of brass.

U. T. Hungerford, president of the widely known brass and copper company bearing his name, was a guest of honor at a dinner in celebration of his eightieth birthday at the Hotel Biltmore on Wednesday evening, December 14, given by Bernard Ris, secretary of the company, and for forty-three years associated with him in business.

Mr. Hungerford was born in Torrington, Conn., December 14, 1841, one of twelve children of John and Charlotte Austin Hungerford. He comes from New England stock, dating back to 1639. The name has been intimately associated with the brass industry in Connecticut where his father, John Hungerford, in 1834, built the first brass mill in Torrington.

Mr. Hungerford has always maintained an active interest in the place of his birth, and on May 28, 1917, presented to the town the large and completely equipped Charlotte Hungerford Hospital in memory of his mother.

In 1865 he became associated with Wallace & Sons, Brass & Copper Rolling Mills, Ansonia, Conn., acting as their New York representative and manager until 1895, when he established the U. T. Hungerford Brass & Copper Company.

Mr. Hungerford's capacity for work seems almost inexhaustible, and even to those who are intimately associated with him is a cause for wonderment. Although residing at Briarcliff, N. Y., it is rare indeed that he misses his daily visits to the institution over which he presides and maintains a close supervision over all its activities. Of him it may truthfully be said that he is "eighty years young." Because of his prominence and years of uninterrupted service in his chosen field, Mr. Hungerford may rightly be called the "dean of the brass and copper distributors."

H. P. Parrock is leaving Buffalo to make his home in the East. Mr. Parrock is engaged to do special work with the Draper Corporation, at Hopedale, Mass.

Dr. William Blum, of the Bureau of Standards, has been elected chairman of the new Division on Electrode deposition of the American Electrochemical Society, sanctioned by the Directors at the last business meeting.

Wadsworth Doster, formerly sales manager of the Sundle Engineering and Manufacturing Company, 1105 Frankford avenue, Philadelphia, Pa., manufacturers of finishing machinery for brass and copper rolling mills, has been elected vice president of the company.

F. A. Coleman, who has been engaged in the design and manufacture of foundry equipment for the past seventeen years, on November 1st resigned his position as Vice-President and General Manager of The Foundry Equipment Company, Cleveland, O. Mr. Coleman is now located at 1951 E. 57th St., Cleveland, O.

The many friends of **Franklin D. Jacobs,** well known throughout the country among the hardware trade, foundry supply houses, and kindred lines, will be glad to know that he has so far recovered from his illness of the past six months that he is now removing from Milwaukee, Wisconsin, to Cleveland, where he is resuming his work as special sales representative with the Osborn Manufacturing Company.

F. A. Jackle has been appointed manager of the Metal Works plant of the Chase Companies, Waterbury, Conn. Mr. Jackle has been connected with Chase interests for past seventeen years, starting as a clerk in the Metal Department, not many years after the Rolling Mill was established. Mr. Haines, who has been acting as superintendent of the production departments of this plant, will continue for the present to assist Mr. Jackle, but later may be transferred to the sales department.

Carl F. Dietz, president of the Bridgeport Brass Company, issued an announcement yesterday of a readjustment of the various heads of the company, which goes in effect January 1. **Walter B. Clark,** who has been works manager at the mills product division on Hausatonic avenue, will be general works manager of the plant. This position is similar to the one held by **William R. Webster,** now vice president of the company. **Arthur Brewer,** chief engineer, becomes works manager of the mills products division. The plant engineering and maintenance department will be known as the plant engineering department and supervisor of maintenance. **E. R. Feicht** will be placed in charge. **G. E. Oakley,** who has been assistant sales manager of the fabricating department, is advanced to sales manager. **Warren D. Blatz** becomes general sales manager of the entire company.

The process engineering department will be absorbed by the research engineering department and will come directly under the supervision of Vice President **William R. Webster.** The cost accounting department will be temporarily in charge of **Paul Swartz** of the **R. G. Rankin Company** until the work of installation has been completed. The head of this department will be announced later.

DEATHS

HENRY VITS

Henry Vits, founder of the Aluminum Goods Manufacturing Company, Manitowoc, Wis., the largest concern of its kind in the world, and a pioneer resident of that city, died suddenly at his home on South Fourteenth street, on December 7. Death was due to apoplexy and came within a few minutes after he had been stricken.

News of the death of Mr. Vits came as a surprise and shock as he had been active up to his very last hour, having been at the aluminum goods factory during the day and having visited with friends.

Mr. Vits was born in Rheydt, Rhine Province, Germany, on January 21, 1842. His father, William Vits, came to the United States in 1854, and located in Meeme, Wis., where he purchased land and then returned to Germany to bring his family here.

Mr. Vits built one of the first grist mills in Manitowoc County at Meeme, but later disposed of it and in 1873 he removed to Manitowoc where he engaged in the tannery business, continuing in this line until the late 90's.

In 1898, after retiring as postmaster in which position he served for four years, Mr. Vits decided to engage in the aluminum manufacturing industry, and the business which he established under the name of the Manitowoc Aluminum Novelty Company, which was engaged in the manufacture of combs and smaller articles of aluminum ware became the foundation of the present immense concern under the name of the Aluminum Goods Manufacturing Company in 1908. Three years later an organization comprising the Manitowoc plant, the plant of the Two Rivers Aluminum Company, and the New Jersey Aluminum Company, of Newark, N. J., was created, and Mr. Vits retired from active management of the business which was taken over by his sons, George, Albert and Hugo.

HENRY VITS.

Mr. Vits retained an interest in its affairs, however, up to the very day of his death, and was a visitor at the plant almost daily. Some of the old employees of the company started work with him in the small factory, and on his visits to the plant in recent years he never failed to look them up to exchange greetings and say a kindly word. This democracy was one of the outstanding characteristics of the man in daily life and accounts in a measure for the universal esteem in which he was held.

He always took an active part in public affairs, being one of the leaders of the Democratic party in the state. He served as member of the State Legislature in the Assembly, and as member of the City Council and the Board of Supervisors, besides being postmaster of Manitowoc. His interest in education was evidenced by his being connected with the school boards of the community for practically forty years. The public's confidence in Mr. Vits finally caused a delegation of citizens to request him to become a mayoralty candidate three years ago; but this he declined to do.

Besides his wife, Mr. Vits is survived by his three sons and two daughters and eleven grandchildren.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

ANACONDA MERGER

JANUARY 3, 1922.

The absorbing topic of interest in the local brass industry during the month has been the offer made by **Anaconda Copper Mining Company** to the stockholders of the **American Brass Company**. The offer in brief, was that the Anaconda Company was willing to pay the stockholders of the American Brass Company $150 and three shares of stock in the Anaconda Company for each share of American Brass Company stock.

Report of some such offer had been prevalent for several months, which had resulted in a boom in American Brass stock. Although selling as high as 440 during the war it had dropped to 150 last summer. The report of possible absorption by the Anaconda Company resulted in the price soaring to 255 before the rumor was confirmed since, when it has jumped to 280. The book value of the stock is reported to be $325 per share. The par value of the Anaconda stock is $50, but has recently been selling for about $46. The offer requires the approval of 51 per cent of the stockholders of the American Brass Company. A meeting in New York of the larger stockholders of the company, representing 40 per cent of the company's stock, approved of the plan and voted to submit it to the other stockholders.

Indications point to the acceptance of the offer by the American Brass stockholders, for as pointed out by Chairman John D. Ryan of the Anaconda Company, the latter might start a series of brass mills running from Montana to the Atlantic coast and thus put the American Brass Company at a competitive disadvantage, as the former plants are at a distance from the coal fields and copper mines.

Whether or not the acceptance of the offer will cause any disturbance here or affect the future development of the industries in the cities is viewed in various lights by local manufacturers. Mr. Ryan declared that the Anaconda Company, if it obtained control of the American Brass Company, would retain the present organization and personnel: that it had no new men to put into the organization and no friends for it to take care of and that if the result of the sale would be the disintegration of the organization he would not want to buy. The object of the proposed deal, Mr. Ryan said, was that the Anaconda Company wished to tie up with the biggest outlet there was for raw copper in order that the entire output of its copper mines might be assured of a market without difficulty.

Largely because of this statement of Mr. Ryan's the general opinion of the local brass men is that instead of hurting the brass industry here, the consolidation will be of benefit to the entire trade and act as a spur to hasten back normal conditions. The consumption of all the Anaconda's copper products by the American Brass Company, it is reasoned, will start more business moving which will benefit all. The American Brass Company, it is felt, should be able to manufacture cheaper, and so obtain more orders, because of saving in getting its copper direct from the mines rather than through jobbers' hands. This, it is believed, should lead to a general revival in all brass business, and result in consumers of brass and brass products taking a less conservative attitude than in the past year.

On the other hand, some fear that the consolidating of the biggest copper producer and the biggest copper consumer, may lead to a price cutting war with the other local producers of brass and brass goods. The American Brass Company being in a position to sell its product cheaper because of lower cost of its copper, might hurt the market of the other brass producers, and cause them to also cut their prices and so cause serious injury to the local industries.

This latter possibility was no doubt responsible for the rumor which started immediately after the report of the consolidation, to the effect that the two next largest brass producers in the city—the **Scovill Manufacturing Company** and the **Chase Companies**, comprising the Chase Metal Works, Chase Rolling Mill and Waterbury Manufacturing Company—and possibly the Bristol Brass company of Bristol were considering a working agreement with a consolidation of some of the other copper companies, such as the Calumet & Hecla, Utah, Chili, Kennecott and Inspiration. Coincident with this report, the Scovill stock took a jump from 320 to over 400. Brokers, however, declared that this was merely sympathetic with the rise in American Brass stock, and as the stock later subsided to around 260, the latter theory would seem to be borne out. According to the rumor, the agreement, if any, would be merely to use the entire output of copper produced by the copper companies concerned.

John H. Goss, superintendent of the Scovill company pronounced the rumor only dope and said that if there was anything to it he knew nothing of it. **Fred S. Chase,** president of the Chase companies, went further, saying there was nothing in the story about a combination of the Scovill and Chase interests or between the Chase interests and the copper mines. It is felt, however, that the local brass industries not concerned in the American Brass-Anaconda merger, do not look with equanimity on the consolidation of the biggest single producer of copper with their largest competitor, and that also the smaller copper companies would not be pleased to see the Anaconda company have first call on

the copper market of the American Brass Company, as the latter had been buying its copper from other producers than the Anaconda.

When the American Brass Company was first formed of a combination of other companies, an attempt was made to include the Scovill company and **Plume & Atwood Manufacturing Company.** The two latter stayed out, however, and the combination finally comprised the Waterbury Brass Company, Benedict & Burnham's and Holmes, Booth & Hayden's of this city, the Coe Brass Company of Torrington, the Ansonia Brass & Copper Company of Ansonia and the Chicago Brass Company of Kenosha, Wis. Subsequently a plant was acquired in Buffalo. The capital stock is $20,000,000, of which $15,000,000 is outstanding.

REVIEW OF THE YEAR

It is the general belief of those concerned in the local brass industry that although there is no sign of great prosperity in sight, that the worst of the depression is over rather than ahead. A year ago the industry was just entering the long period of depression and the outlook was much darker than at present. The depression actually began in November, 1920, and business fell away, employees were laid off and wages reduced slowly but steadily until the end of last summer. Beginning in September, many of the shops experienced a slight revival in business; in some of the shops this revival was not permanent, although better today than a year ago; in others it did not result in an immediate increase in the volume of business but rather in a slow but steady revival which continued up to the present date and appears to be still continuing.

Most of the factories are operating at about 50 per cent of their capacity, although busier than a year ago at this time. Wages have been reduced nearly uniformly in all the local industries at three different times during the year. The average rate for common labor a year ago was 45 cents an hour. It is now 27½ to 30 cents an hour. Most shops are now operating 55 hours a week, although some departments are working but 30 to 40 hours. During the summer practically all were working but 30 to 40 hours a week.

The **Scovill Company** officials stated that their business for the year had been very unsatisfactory, beginning at the time of the first depression in the brass industry in November last year. As the depression developed rapidly they started in cutting forces, and did everything possible in the way of consolidation and centralization as the war had resulted in decentralization to a large extent. Some departments of the Scovill company are working five days and a half, some four days and some only three days. The number of employees a year ago was 6,000, in September it was 4,300 and it is now about 4,000.

The **American Brass Company** reports conditions about the same as a year ago, but with a slight prospect of betterment. The number of employees in its local factories then was 3,190 and it is now 2,794. Business has improved slightly since fall.

The **Waterbury Clock Company** reports slightly better business than during the summer. They are now employing about 1,400 men, most of them skilled workmen. Consequently the wage rate varies, but the reduction during the year has been from 20 to 25 per cent. A year ago there were about 2,000 employees. The plant is now working at about 60 per cent capacity. Business there too has improved slightly since summer.

F. S. Chase, president of the **Chase Companies,** authorized the following as the official statement from the officials of the **Chase Metal Works** and **Chase Rolling Mill** which perhaps sums up the general condition of the local industries concisely:

"That 1922 will be a better year in the brass business than 1921, is the opinion of the officials of the Chase Metal Works and Chase Rolling Mill. The Chase Metal Works plant is being operated during the week between Christmas and New Year's with the hope that orders sufficient to justify this action will be forthcoming after the first of the year. The orders for brass products received by these concerns during the last three months of 1921 averaged over 50 per cent more than during the summer months of 1921. It is hoped that a similar increase will be noticed during the first months of 1922.

"The brass business has encountered many obstacles during 1921. There have been far too many mills to supply the small demand, and in addition to this, the government and private owners have released large quantities of brass of various kinds, hangovers from the war, which have had a depressing effect on the market, this second hand material being used in many cases rather than new material manufactured. By 1922 it is hoped that most of this material will be absorbed.

"Another thing which should tend to make the brass business better in 1922 is the recent organization of the Copper and Brass Research committee. This committee was formed by leading copper producers and copper and brass fabricators, with the purpose of increasing the use of copper and brass by means of advertising, and a campaign of educating the public to use copper and brass in preference to other metals of cheaper first cost, but of very questionable durability and greater cost in the long run. Once the public recognize the real desirability of copper and brass, there will be a far greater demand for these products than there is today.

"The most serious obstacle in the way of good business for Waterbury and other centers of the brass industry is the possibility of foreign competition, particularly from Germany and Japan. Unless this country adopts the American Valuation in its new tariff, we may see this country flooded with brass and copper products manufactured abroad, which due to their inferior living conditions and depreciated currency, can be sold in this country far below the cost of production here. Everyone interested in the brass business, or as a matter of fact, directly or indirectly dependent on the manufacturing interests of the country should do everything they can to bring to the attention of their representatives in Congress the importance of this American Valuation as a step in the right direction." W. B.

TORRINGTON, CONN.

JANUARY 3, 1922.

After-war depression was the outstanding feature of the past year in the metal industries. Torrington like other manufacturing communities was hard hit by this depression. Factories were operated on short time schedules and with greatly curtailed forces, and at one time the situation reached such an acute stage that the town and borough found it necessary to combine in authorizing improvement work to provide work for the many unemployed. In the early fall, however, the situation showed signs of improvement, and today on the threshold of the new year Torrington is looking forward with optimism to a return of its old prosperity. Most of the shops are working on normal time and are gradually increasing their working forces. The prospects for 1922 are bright.

The various factory groups of the **Community Co-operative Company** have elected directors as follows: American Brass, Walter Harrison; Turner & Seymour, John Whalen; Standard, Daniel Cameron; Torrington Manufacturing, Eugene Bartram; Hendey Machine, G. H. Knight.

Joseph Eugene Jobin, 57, for 25 years employed at the Hendey Machine plant, died December 19.

F. L. Braman, vice-president of the **American Brass Company,** was given a silver loving cup during the past month upon his retirement as superintendent of the Methodist Sunday school. A banquet in his honor was held by the school workers and he was made superintendent emeritus.

Frederick F. Fuessenich, for many years president of the **Hendey Machine** plant, has returned from New York, where he has been under the care of specialists for the past three months. His condition is greatly improved.

The annual report of the **Charlotte Hungerford** hospital shows that 629 patients were admitted to the institution during the year. James A. Doughty was re-elected president and Robert C. Swayze vice-president. This hospital was given by U. T. Hungerford as a memorial to his mother.

The **Maria Seymour Brooker Memorial,** a Torrington welfare institution given by **Charles F. Brooker** in memory of his mother, rendered a wonderful service to the community during the past year. Its activities, covering all fields of relief work among the helpless, needy and suffering of the

town, have been so great and varied that it is difficult to summarize them within limited space. The day nursery, the nurses' home, the child welfare stations, the medical clinic, district nurse and anti-tuberculosis work are only a few of its multitudinous activities. Suffering, sorrow and want have been alleviated and scores of children made happy.

At Thanksgiving time many baskets of dinners were distributed to needy families and at Christmas time a delightful party for nearly 200 children of families on the relief list was held. Every youngster received gifts—useful, entertaining or edible. In addition to this, the Memorial played the part of Santa Claus and no little boy or girl who posted a letter to the good old saint was overlooked this year.

J. H. T.

NEW BRITAIN, CONN.

JANUARY 3, 1922.

The outstanding event in New Britain manufacturing circles is the action at the almost defunct **New Britain Machine Company** whereby **Charles F. Smith,** regarded as one of the foremost manufacturers in the country, takes over the helm as chairman of the board of directors.

Mr. Smith supplants **Frederick G. Platt,** the veteran chairman, who has been compelled to lay aside his business cares for a time, at least, and has gone to John Hopkins Hospital to undergo an operation.

Elsewhere in the city conditions remain about stationary. The **P. & F. Corbin** division is reported as doing a fine business and a glance at the order books shows them to have fully as many, if not more, orders than they had when the war broke out. **Landers, Frary & Clark** is going along at high speed, since this is their busy season anyway. The **Stanley Rule & Level Company** is maintaining its regular schedule and the **Stanley Works** is too. The **North & Judd Manufacturing Company** seems to be one of the soundest firms in the city and its steady business continues with most satisfactory stability.

A brief survey of the past year shows all factories here to have passed through a most trying period of depression. All salaries and wages have been drastically cut from the war standard. A peep into the future, however, shows a steady improvement in business which while slow, nevertheless seems healthy and a good year is expected.

H. R. J.

ROME, N. Y.

JANUARY 3, 1922.

Reviewing business conditions in the metal industry line in this city for the year just closed, H. T. Dyett, president of the Rome Wire Company, in a statement said:

"During the past twelve months I have seen the worst business conditions that I have seen in my life. Never before has it seemed impossible for our company to sell enough wire to operate at least full day times, and during the past ten or twelve years there have only been one or two short intervals when we have not operated our plant day and night. Our sales department has worked as never before during the past twelve months to get business. Many times we have taken large orders at below our estimated cost of production in order to keep our organization together. Even at the present time, although business looks better than it has, we are operating at only part capacity.

"Our chief thought during the past twelve months has been to get enough work for our employes. We believe we have had our full share of business, and that although there has been but slight improvement in business so far, we shall ere long see an improvement in the volume."

BIG GROWTH IN ROME INDUSTRIES

The growth of the Rome Wire Company which resulted from the absorption of two small companies in 1905 to its present large proportions, consisting of 15½ acres of floor space, may be taken as a sample of the growth of the other metal industries of this city, including the Rome Brass & Copper Company, the Rome Manufacturing Company, Rome Hollow Wire & Tube Company, and the Rome Metal Mills. During the past twelve years these companies separately and combined have progressed and expanded to such an extent that Rome has grown from a rather insignificant factor in the brass and copper business to one of much importance, being now the second or third greatest copper city in the United States, manufacturing practically all kinds of brass and copper articles.

Of course no one can predict with certainty when business conditions will return to a more normal state, but there is a general feeling here that two or three months will witness a marked change for the better, and perhaps by early spring things in the metal industry line will have attained their old status and the wheels of industry will again be running with smoothness and regularity.

M. J. D.

ROCHESTER, N. Y.

JANUARY 3, 1922.

With the end of 1921 in sight manufacturers of Rochester realize that they are about to part company with one of the exasperating and unprofitable years that had fallen to the lot of the American business man in many a decade. All in all, it is not believed that so great a year of depression followed the close of the Civil War as has this about to end.

Of course, in a city of Rochester's size and great diversity of manufacturing, there have been exceptions to the rule. The **Rochester Can Company,** for instance, did a greater business with a shorter work-day than at any period in its history, and anticipates a still larger business in 1922. The can company is an extensive user of tin, copper, brass, aluminum and iron.

Big plants like the **Eastman Kodak Company, Bausch & Lomb Company, Yawman & Erbe, Pfaulder Company, General Electric Company, Todd Protectograph Company** and the machine tool plants have all been operating with largely reduced forces and consequently greatly decreased outputs. There has been a slight improvement in some of the large manufacturing plants since October, however, but the advent of the holiday season has brought a season of dullness which will continue until after the New Year.

Manufacturers say the outlook for 1922 is very encouraging, all things considered, and it is expected that all of Rochester industries will feel the effects of a general rejuvenation as the new year progresses.

The **Rochester Can Company** has distributed among its 200 employees a bonus of approximately $26,000 as a Christmas gift, according to an announcement made by Macolm E. Gray, president of the concern.

On December 1, 1920, the company was forced to cut the wages of its employees 20 per cent. and to reduce the working time 5½ hours per week. But throughout 1921 the company had the heaviest business it ever experienced, and production was increased in spite of the shortened hours. Mr. Gray states that it was the opinion of the company that the right thing to do would be to give back to the employees in a lump sum the extra 20 per cent they would have earned had not the retrenchment taken place. As a matter of fact, Mr. Gray said, the total the company was able to distribute brought the factory and office workers' yearly salaries to more than they had ever earned before.

Some of the office girls got a bonus of as much as $500 and one man got $2,000. Everybody, from office boy to superintendent participated. There are about 28 persons in the office and on the sales force, and the rest, numbering 172, work in the factory in Hague street.

Mr. Gray said the workers under the present 38½-hour week are doing more and better work than they did under the 44-hour week in force a year ago. He looks forward to added business in 1922.

G. B. E.

PROVIDENCE, R. I.

JANUARY 3, 1922.

The industrial situation in Rhode Island shows but little actual change, although there is a general feeling of a slight improvement. This, however, is not manifested in any increase in the working schedules of the numerous plants of the State but is rather to be seen in the larger number of operatives that are being employed. Consequently there

may be said to be an improvement in the matter of the unemployed of the State.

There is an optimistic spirit prevalent among the manufacturers of all lines, especially among the metal trades that is more encouraging than has been apparent for a long time. This is not of the "boom-expectancy" brand but of the constant and consistent upbuilding of trade, that augurs well for the future business trend.

In the jewelry lines the depression has been unusually severe and the present prospects are the least encouraging of any of the metal trades. One reason for this is that jewelry being a luxury is one of the very first lines to feel a financial business depression and the last to recover. Another handicap is the lack of tariff protection against the cheap labor conditions of across the water.

The **R. Plews Manufacturing Company,** Central Falls, manufacturers of tin cylinders and sheet metal workers, are not being pressed with orders for the product of the plant to such an extent as formerly. For a number of weeks the plant has been operated three days weekly, although occasionally on account of some special orders to be filled, a full time schedule has been maintained for a few days at a time.

The **Kinloc Manufacturing Company** of Providence, which will manufacture machinery, tools and jewelers' supplies has been granted a charter by Secretary of State Parker under the laws of Rhode Island. The authorized capital is 500 shares of non par stock. The incorporators are Russell L. Colley, Henry W. Colley and Ernest P. B. Atwood.

The electroplating business conducted for several years by **Frank W. Grant & Company** and recently taken over by the **Beverly Electroplating Company,** at 7 Beverly street, has been acquired by F. Smith and F. Strong, who will continue it under its latter name. New quarters have been taken at 74 Clifford street where, as soon as additional apparatus and numerous improvements can be completed, the two plants will be consolidated.

The **Atlas Sheet Metal Works,** 237 Dyer street, had the contract for all the copper work on the new school building at Saint George's Memorial School at Newport. They also had the contract for a marquee on the Chin Lee restaurant, Broadway, New York city.

Horace Thurston, inventor, who founded the Thurston Manufacturing Company at Providence in 1883, and headed the business until his retirement in 1913, died at his home Thursday, Dec. 22, in Kingston, R. I., in his 70th year. He was prominent in fraternal as well as business circles, being a prominent member of both the Masonic fraternity and of the Odd Fellows. He was born at Norwich, Conn., and his most noted achievement in the invention line was a special milling machine, which has been extensively used in manufacturing jewelry establishments, and in the manufacture of high-grade tools. After retiring, he spent several months with Mrs. Thurston, who survives him, in foreign travel, and on his return took up his residence at Kingston, about three years ago. W. H. M.

TRENTON, N. J.

JANUARY 3, 1922.

Business conditions for the past year were not very favorable until fall when the situation began to brighten up somewhat. Some plants that were operating on half time placed the factories on full time again. Conditions for the near future are uncertain, but the majority of manufacturers believe that the coming spring will see all factories running on full time with plenty of orders. One manufacturer said that business conditions had become normal again and that he did not expect to see any further slump.

Joseph H. Quigg has been appointed receiver for the **New Era Toy and Novelty Company,** of 325 Academy street, Newark. The appointment was made by Judge Lynch following the filing of involuntary bankruptcy proceedings in the Federal Court. According to the petition the company's liabilities are between $19,000 and $20,000, with assets of $8,000.

American Metal & Cornice Works, Elizabeth, N. J., has been organized by Harry Laiser and Jacob Addelstein to manufacture metal building products.

The **Hendricks Brass & Copper Company,** 130 Market street, Newark, has been organized to manufacture brass, copper and other metal products by Elwood Hendricks, of 645 Springdale avenue, East Orange, N. J.

The **Trenton Chemical Company,** with offices at 1109 Division street, Trenton, has been incorporated to deal in chemicals.

Newark Vradia Company, of Newark, N. J., has been incorporated at Trenton with $100,000 capital to deal in electrical supplies.

K. & K. Alarm Company, of Atlantic City, N. J., has been incorporated at Trenton with $1,000,000 capital to deal in automobile safety devices.

The **Jordan L. Mott Company,** of Trenton, N. J., with a number of other tile concerns, pleaded guilty as members of the tile combine and has been fined $4,000 by Judge Van Fleet in the New York Federal Court. The concerns pleaded guilty to price fixing in violation of the Sherman anti-trust law.

Oliver O. Bowman, treasurer of the **Jordan L. Mott Company,** recently entertained the members of the board of directors of the Broad Street National Bank, Trenton, N. J., in honor of the deposits at the bank reaching a total of $10,000,000. Mr. Bowman is one of the directors of the bank.

Electro-Magnetic Corporation, of Newark, N. J., has been incorporated at Trenton with $2,000,000 capital stock to deal in electrical appliances. The incorporators are Frank B. Schanne, William S. Benson and Irving W. Tepple, all of Newark, N. J.

BALTIMORE, MD.

JANUARY 3, 1922.

The Metal trade is looking forward as a whole with optimism toward the new year and is confidently anticipating a general improvement in industrial conditions and in the volume of business. Owing to business depression throughout the country last year, the metal industry in Baltimore did not fare any too well. Tin specialties have been dull, especially during the past few months, but much better business is expected in 1922. The outlook for the next few months in the can-making business reflects a better record than was made last year. Foundry work has been exceptionally quiet, but indications point to early better conditions in 1922. Sheet metal; very sluggish just now, but inquiries point to satisfactory 1922 results.

The **Crown Cork and Seal Company's** Highlandtown plant has resumed work after a shutdown of two weeks. About 600 employees are at work, which is 40 per cent of normal. It is reported that the outlook for business is growing brighter.

The **Aeronautical Supply Export Corporation** has been incorporated with a capital of $24,000.

The **Maryland Metal Building Company** has just completed a plant at McComas and Clarkson streets, where will be manufactured for the market various metal equipment. W. J. L.

INDIANAPOLIS, IND.

JANUARY 3, 1922.

The **Haskell & Barker Car Company** at Michigan City, Ind., is receiving bids for the construction of a foundry addition and a new power plant to cost approximately $500,000. The construction will be of brick and steel.

Debts amounting to $12,008.11 and assets amounting to $11,991.95 are listed in a voluntary petition in bankruptcy filed in federal court by the **Elwood Foundry,** of Elwood, Ind.

The **Brass Foundry and Machine Company,** at Fort Wayne, Ind., has increased its capital stock from $1,700,000 to $2,100,000.

John Westerfield, of the **R. W. G. Foundry,** at Anderson, Ind., reports that business is fairly good. The foundry has been in operation five days a week with its regular force of employes.

Directors of the **Armstrong Foundry Company** held a meeting at Huntington, Ind., recently, at which the reopening of the plant there was discussed. Orders have been received which probably will result in the starting of the plant and the employment of about 100 men.

The **Marion Foundry Corporation** has changed its place of business from Marion, Ind., to Auburn, Ind., and has decreased the number of its directors from six to five, and reduced the amount of capital stock from $100,000 to $56,500.

E. B.

CLEVELAND, OHIO

JANUARY 3, 1922.

Prognostication for 1922, in industry in this section in general and in the metal industries in particular, must contain a note of optimism. Yet, if the province of the trade journal, as representative of a certain class of industry, is to adhere strictly to the truth, this prediction must be tempered. To state that the prospects for a better turn to business as a whole are good, simply means that such prospects are based upon hope rather than expectation.

On the other hand a brief analysis of the industrial, and commercial, situation, locally, of course, reveals hidden facts that point the way upward. And foremost among these must be taken the passing holiday season as a barometer. With few exceptions retail merchants reported Christmas business equal to last year, which was not the biggest but nevertheless a big year in retail merchandising at the end of the year. In some instances indeed reports show that 1921 holiday business exceeded that of 1920.

The conclusion is readily drawn. The much-discussed hard times must exist in fancy rather than fact. That there is unemployment cannot be denied. That there is a buying power still, something akin to normal, also cannot be denied. The only question to be answered, therefore, is what lasting effect will the better than expected trend, during Christmas time, have upon business generally and ultimately.

Meanwhile the labor situation is one requiring deep consideration at this time. That organized labor intends to remain organized quite as thoroughly as advocates of the open shop would operate on that same open shop, is apparent in the new effort of the Metal Trades Council to increase its membership. A drive to organize all metal tradesmen in this city will be started at an early date, according to Henry Raisse, secretary of the Council. It is claimed that the metal trades operatives, which comprise 16 groups, and have about 100,000 members, are poorly organized in Cleveland. The effort will be, it seems, to make them the strongest labor organization in this territory.

The dispute between employers and pattern makers seems to be no nearer settlement with the turn of the year than it was when it started back in July, 1920. This appears to be the longest battle between employers and workers on record here. The original 675 men who walked out still are out as a unit, F. B. Reid, business agent for the pattern makers asserts. In this respect the American Plan movement has failed so far. The pattern makers were first to be involved in this dispute.

Police are seeking robbers who blew the safe in the United States Copper Products Corporation on the western edge of the city, and escaped with $1,000 cash.

The Protex Signal Company, of this city, has been made defendant in a suit filed by Harrison W. Greenup, Pawtucket, R. I., in which he alleged the company is infringing on his safety signal. An injunction is sought to prevent the company from doing this. Profits from the alleged infringed device also are sought through this suit.

Clarence Ryks, general manager of the **All Metal Weather Strip Company**, died suddenly while riding on a street car here. He was 44. Death was believed to be due to heart disease.

C. C. C.

DETROIT, MICH.

JANUARY 3, 1922.

The year just drawing to a close has been one of the most trying of any in the history of the metal industry. Tight money, slow collections and scarcity of orders have caused many a wakeful night.

Nearly a year and a half have passed since the general slump started, but notwithstanding all the disheartening experiences manufacturers are just as optimistic for the future as they were when everything was coming easily. Consequently nearly everyone who discusses the future has words of hope and cheer for the year 1922. Many are the manufacturers who have not made a dollar for more than fifteen months.

Pressed from all sides they have had every reason to be discouraged, but they are not. Already they have plans mapped out for pushing business in the coming year. How could business do otherwise than revive when such hopeful and enthusiastic persons overshadow the doubt and pessimism of the few. Of course business is going to pick up after the first of the year. Nearly everyone says so, and it couldn't be otherwise under such conditions. Automobile manufacturers have taken the first step by making substantial cuts in cars. This will stimulate sales. The Paige, the Cadillac, the Hudson and the Essex already have announced what they are going to do. The Ford Motor Company, which closed a year ago until about February 15, is planning to open again about January 8.

It is true, according to the Manufacturers' Association secretary, that fewer men are working today than at any time within the year, but this is due principally to the holiday dullness that we always expected at this season of the year. So watch things start in Detroit and vicinity along about February 1. Of course a smashing boom is not anticipated, but 1922 is going to be one of the good years so far as business is concerned. Everything points that way. "So cheer up," says the enthusiastic, "and give Business every opportunity to make good."

F. J. H.

LOUISVILLE, KY.

JANUARY 3, 1922

The 1921 season with the Louisville coppersmiths has been a poor one practically from start to finish, and the turn into the new year has been looked forward to with the general idea that as it couldn't be any worse than 1921, it may be better. The Kentucky shops for years handled a heavy distillery business. When this slowed up there was war work, and when distillery and brewery business went flat there was quite a volume of business of a commercial and industrial nature that had been neglected during the war period. For the past year there has been very little sheet metal work. There has been a fair demand for castings, nickel plating and enameling have been fair, there has been a heavy demand for plumbing goods, steam goods, etc., but the houses handling a strictly copper and brass business have not been busy.

There has been a fair volume of business in milk and candy plant equipment, and some demand for special auto accessories. The auto manufacturers have not been especially busy, and whereas for a time there was quite a demand for special auto castings, that business has been very slow for a year or more.

There is not a sheet copper shop in Louisville which could not have all the business it could handle if the owners were willing to take chances and would bend tubes into coils, and make kettles and connections for the amateur distillers who are making moonshine or white whisky now that red whisky cannot be had except for medicinal purposes. Some houses have taken chances and have made up some stock, but they are closely checked and it is too dangerous to take chances. It is claimed that most of the small stills, tubes, etc., that are in use are made by journeymen coppersmiths who are out of work and who have taken chances in order to pick up some easy money. From the thousands of stills that have been captured and wrecked by authorities of late it is indicated that quite a large number of still parts are being made somewhere.

All in all the past year has been one of the poorest on record, but prospects for 1922 are looking better than they did for 1921.

A. W. W.

MONTREAL, CANADA

JANUARY 3, 1922.

The month of December is usually a dull month in the non-ferrous industries, even when conditions are normal, but under present conditions business is a little duller than

usual. At this time of the year, programs and policies for the coming year are usually well considered and a more or less active start has been taken to put them into being for the coming year. This month has also been something unusual as the Dominion Election has been held and many firms who have more or less extensive dealings with firms in the United States have hesitated to take any steps in connection with the coming year's business.

It is so long since there has been any activity in the scrap metal market that the dealers have been almost forgotten. From inquiries and quotations they have given the past ten days they expect a real revival before the spring of 1922.

The **Canadian Pacific** and the **National Railways** are planning fairly extensive improvements.

The **Ottawa Metal Products Company** have taken over the plant of the **Ontario Specialties, Ltd.,** together with the assets and liabilities of said company and are to manufacture the vacuette suction sweeper along with their regular line of paper and pulp brass and bronze goods. **Sam R. Frances** will continue as superintendent and sees a great future for business in store for the new company.

Capitalized at $90,000 the **Mongean Company, Ltd.,** has been incorporated to manufacture iron, steel, copper, brass and other metal products.

A. E. Cambridge has been transferred from Toronto to the Montreal office and warehouse of the **E. J. Woodison Company** to take charge of the engineering end of the business.

P. W. B.

BIRMINGHAM, ENGLAND

DECEMBER 24, 1921.

Hopes continue to rise and fall with regard to the immediate future of the British metal trades. No great improvement in business can yet be reported. The Indian market in which the demand for British cabinet brass foundry and stamped and other metal goods for the bazaar trade showed a momentary increase, has become quiet again. A number of orders have been suspended or cancelled as a result, it is understood, of the unsatisfactory position of the rupee and the difficulty experienced by traders in clearing their stocks. Business with other British Dominions, except the Australasian, has fallen off. Electroplaters among others are doing less export business. Indian purchases have been cut down to the barest minimum. At the same time hotelkeepers are buying very cautiously, while the demand arising from the reconditioning of ships has been very disappointing. Unemployment in the jewelry trade has received very little of the relief which the approach of Christmas was expected to bring. Brass founders in various departments are suffering from the stagnation in shipbuilding, while the suspension by the Government of the orders placed for the four new battle cruisers has dashed the hopes of large contracts for the Midlands.

One of the few hopeful signs is the fillip given to the motor car and motor cycle trades by the recent London shows. Most of the firms concerned are beginning to recall their suspended staffs. Nothing like full work has been resumed as yet, but there is a prospect of greatly increased employment after Christmas. Aluminum founders are expecting to profit by the improvement in the motor trade, and so also are the lamp manufacturers who have been doing very little for some time past in car lamps, while their general trade has been far below the winter average. Aluminum hollow-ware is holding its own fairly well in the home market as far as better class goods are concerned, but in cheap lines German competition is still serious.

Prices of non-ferrous scrap have been maintained better than might have been expected considering the depression in manufacturing circles. The expectation of extensive dumping upon the home market of the Government scrap the sale of which was the subject of so much criticism has not been realized so far.—G.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Yorkville Manufacturing Company, Inc., of Brooklyn, New York, has opened an office at 20 W. Jackson Boulevard, Chicago, Ill.

Gibbons Brothers, Ltd., Dudley, Worc., England, have been appointed representatives of the British Isles for **W. S. Rockwell Company,** New York.

The Delaware Seamless Tube Company, Auburn, Pa., has completed the erection of new building at its plant. This company operates a rolling mill.

The telephone number of the **J. W. Paxson Company,** Philadelphia, has been changed to the following: Bell—Garfield 1000-1004; Keystone—Park 4671-4673.

The Dayton Aluminum and Manufacturing Company, Dayton, Ohio, recently increased its capital stock from $10,000 to $50,000. This company has spinning, stamping, soldering, polishing and lacquering departments.

The Quinnipiac Foundry, Inc., New Haven, Conn., has been incorporated with a capital stock of $5,000 to make brass, bronze and aluminum castings. A. B. O'Keefe, L. J. Clawson and W. M. Higgins, of Hamden, Conn., are the incorporators.

The Harco Company, East Moline, Ill., has completed the erection of a new brass foundry. They operate a bronze and aluminum foundry, brass machine shop, grinding room, galvanizing, tinning, soldering, plating, and polishing departments.

The Federal Supply Company, East 79th street, Cleveland, Ohio, has been appointed representative in that territory for the Quigley Furnace Specialties Company, Inc., 26 Cortland street, New York City, manufacturers of Hytempite and Insulbrix.

The Butters-Camp Manufacturing Company, Edgewood avenue, Atlanta, Ga., have opened a plating and galvanizing department to handle nickel, copper, silver and gold plating. Departments operated are galvanizing, plating, polishing, and lacquering.

The Ithaca Washing Machine Company, Ithaca, Mich., has been organized by Chester and William Swartz and others to manufacture washing and ironing equipment for laundries. They are interested in obtaining equipment for tinning gray iron castings.

The M. L. Oberdorfer Brass Company, Syracuse, N. Y., has leased its E. Water Street Plant to the C. F. Gilmour Company, who represent the Dodge Brothers Automobile Company of Detroit, Mich., and who will use this plant as a service station.

The Weaver Auto Douser Company, 14 East Jackson Boulevard, Chicago, has been incorporated with $15,000 capital stock to manufacture automatic devices for controlling the operation of motion picture projectors. They are manufacturing at Watts, California.

The Eastern Metal and Refining Company, Boston, Mass., which has been consolidated with Richards and Company, is remodelling its present building, instead of going ahead with their projected manufacturing building at 30 Commercial street. This company does smelting and refining.

Three appraisers have been appointed in Orange County, N. Y., to appraise the estate of **(Colonel B. F. Ambrose Monell)** of the International Nickel Company, who had a summer home in Washingtonville in that county. It is estimated that Colonel Monell left about $15,000,000.

The Riverside Bronze & Aluminum Company, of New Haven, Conn., has been incorporated with a capital of $10,000. The incorporators are: Thomas E. Hyde, president and general manager; H. S. Brown, treasurer; John F. String, secretary. They operate a brass, bronze and aluminum foundry.

The Oregon Brass Works, Portland, Oregon, has commenced the erection of a foundry and warehouse. The former will be 50 x 90 feet and the latter, 40 x 60 feet. This company operates a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, and plating and polishing departments.

The United Smelting & Aluminum Company, Inc., of New Haven, Conn., have made arrangements with Mr. Theodore L. Dodd, whereby Mr. Dodd will become their manager for Chicago and surrounding territory. New and enlarged office

quarters have been taken in the Railway Exchange Building, 80 E. Jackson Boulevard, Chicago, Ill.

The Tri-State Zinc Products Company, Joplin, Mo., is preparing plans for a two-story factory for manufacturing zinc shingles and other products, estimated to cost about $50,000. Oliver Greenstreet heads the company. This concern operates a tool room, grinding room, cutting-up shop, rolling mill, and stamping, soldering and polishing departments.

The Brant Foundries, Ltd., has announced the completion of a new plant at Brantford, Ont. They specialize in light gray-iron, brass, bronze and aluminum castings. They operate a brass, bronze and aluminum foundry and grinding room. The Brantford Computing Scales, Ltd., with which they are operating has a tool room, plating, polishing, japanning and lacquering departments.

The **Black & Decker Manufacturing Company**, builders of Portable Electric Tools, announce that effective January 3, 1922, they will make a freight allowance on shipments of 100 lbs., or over, to points in the United States and Canada. This will make it possible for all jobbers to sell Black & Decker goods in the United States and Canada without adding anything to the price to cover freight.

The Electro Refractories Corporation, Ellicott Square, Buffalo, N. Y., crucible manufacturer, is rebuilding its plant on Townline Road, East Hamburg, N. Y., destroyed by fire on October 26, with a loss of approximately $200,000. The new plant includes a main works, 50 x 300 ft., and a machine shop, 30 x 75 ft. They expect to be in operation about the beginning of January, and have been taking on much business.

Rogers, Brown and Company, 433 Vine street, Cincinnati, Ohio, pig iron, coke, ferro-alloys and fluorspar ores, have been appointed sole agents in the United States for the sale of aluminum produced by the Norsk Aluminium Company of Christiania, Norway. At present they are importing ingots, shot, and notched bars, 99% and over, 98 to 99% and No. 12 alloy. They carry stocks at Cleveland and New York.

The Surface Combustion Company, Inc., Industrial Furnace Engineers and Manufacturers, 366-368 Gerard avenue, Bronx, New York City, have been awarded the contract for an automatic heat treating furnace to be installed at the Naval Ordnance Plant, South Charleston, West Virginia. This is a furnace for heat treating 16" Armor Piercing Shells as per Navy Department schedule and specifications 3996 opened November 22, 1921.

The Quigley Furnace Specialties Company, 26 Cortland street, New York City, manufacturers of Hytempite, high temperature Cement, Insulbrix, and other heat insulation products, announced they will be represented in the Chicago territory by H. M. Thompson, who was formerly identified with the Thomas Moulding Brick Company, who succeeds Bell & Gossett, former agents. Mr. Thompson will make his headquarters at 105 W. Monroe street, Chicago, Ill.

The Executors of the Estate of **John C. Wiarda** have sold the assets of their chemical manufacturing and jobbing business at 273 Green street, Brooklyn, N. Y., to **Howard B. Bishop,** of 101 Park avenue, New York. Mr. Bishop is a chemical engineer and was for many years connected with the General Chemical Co. and the National Aniline & Chemical Co. The new management will continue the business under the name of **John C. Wiarda & Company, Inc.,** and will enlarge and extend their manufacturing and jobbing facilities.

The Aluminum Goods Manufacturing Company, Manitowoc, Wis., having branch factories at Newark, N. J., and Two Rivers, Wis., recently increased its operating forces to 3,000, and is operating its main factory in Manitowoc on a 24-hour schedule to fill orders for stamped aluminum utensils and drawnware. November deliveries were the largest of any single month in the company's history, and the unfilled orders on December 1, the largest on record. The company operates a rolling mill, tool room, spinning, stamping and polishing departments.

The Grand Rapids Metal Products Company, 1530 Monroe avenue, Grand Rapids, Mich., recently organized, has taken over the plating plant of the Miller Plating Company, of Grand Rapids. The new company will manufacture automobile hardware specialties, metal furniture, phonographs and refrigerators. The plating plant is equipped for plating and polishing gold, silver, copper, brass, nickel and zinc. The company operates a brass, bronze and aluminum foundry, brass machine shop, and stamping, galvanizing, plating, polishing and lacquering departments.

The American Palestine Company, 874 Broadway, New York City, with a capital of $5,000,000, holding charters of two important financial institutions in Palestine, the Urban Mortgage Company of Palestine, and the Industrial Credit Company of Palestine, will open a permanent exhibit in the offices of the above companies in Palestine, covering a wide variety of manufactured products. Their New York office will furnish information about this exhibit, and in regard to the shipment of samples of products. All products exhibited will be under the supervision of able demonstrators.

The American Aluminum Metal Products Company, Burbank, Calif., has completed the foundations of its plant and further construction work will be started as soon as conditions permit. The officials of the company expect to begin operation not later than April 1. The company now has the necessary machinery, tools, patterns, etc., in its possession. Manufacturing experts have been engaged in the east to train the local labor in the manufacturing of cooking utensils. Quite an influx of eastern people, who will be employed in the works, is expected in Burbank. The company will operate a brass, bronze and aluminum foundry, brass machine shop, tool room, grinding room, and spinning, stamping, galvanizing, tinning, brazing, soldering, plating, polishing, japanning and lacquering departments.

The Hardinge Company, 120 Broadway, New York City, announce the following appointments which have been made because of the acquisition by the Hardinge Company of the Pulverized Fuel Department of the **Quigley Furnace Specialties Company. H. A. Kimber,** formerly of the Quigley Furnace Specialties Company, is now in charge of the sales of the Quigley Pulverized Fuel Department of the Hardinge Company, 120 Broadway, New York. **L. W. Marso,** who has been in charge of the Branch Office of the Quigley Company at 427 Oliver Building, Pittsburgh, Pa., will continue business at that office under the name of the Hardinge Company, handling the Quigley Pulverized Fuel Systems. **O. M. Rau,** formerly consulting engineer to the Philadelphia, Rapid Transit Company, will specialize in the handling of Quigley Pulverized Fuel Systems as applied to boilers. **W. O. Renkin** has become associated with the Hardinge Company, in the capacity of Managing Engineer of the Quigley Pulverized Fuel Department.

TIN DISEASE

According to a statement by Dr. A. W. C. Menzies, of Princeton University, in the daily press, tin when subjected to the very low temperature of Arctic regions, crumbled to a gray powder. This affected the cans and tin plate in a vessel used for Antarctic exploration by Captain Scott in 1912.

NINE MONTHS OF AMERICAN BRASS

According to the Boston Traveler of December 24, 1921, income account of American Brass for nine months ended September 30, 1921, compares with year ended December 31, 1920, as follows:

	9 mos. ended Sept. 30, '21.	Year ended Dec. 31, '20.
Net loss	$2,192,988	*$3,354,564
Dividends	1,200,000	1,800,000
Deficit	3,392,988	†1,554,564
Previous surplus	24,056,776	22,502,212
Prof. and loss surplus	20,663,788	24,056,776

*Profits. †Surplus.

REFUSE TO BAR FUSEL OIL

German manufacturers of fusel oil, a by-product of the distillery business, won a victory in the District of Columbia Court of Appeals, although they were not directly a party to any proceedings when the Appellate Court upheld a decision of the lower court which refused to restrain the Secretary of the Treas-

ury from permitting large quantities of the German product to enter the country in competition with manufacturers of butyl alcohol, or butanol, an alleged similar product, under the Dye and Chemical Control act approved last February.

Complaint was made by the Commercial Solvents Corporation of New York, Indiana and Maryland, manufacturers of butyl alcohol, that their business was being ruined because Secretary Mellon was about to order released from customs houses thousands of pounds of German fusel oil, which would be thrown on our markets at a price far below that at which butanol could be manufactured and sold. The plaintiff concern also alleged that the Secretary had erred in declaring that fusel oil was not a synthetic organic chemical, a decision which placed it outside the pale of the Dye and Chemical Control act.

Justice Hoeling refused the plaintiff concern a temporary injunction, and in doing so declared that he was not going to compare his technical knowledge with that of experts employed by Mr. Mellon. The question before the Appellate Court was clearly a matter of technical knowledge, the court held, and the judgment of the lower court was affirmed.—New York Times, December 4, 1921.

NATIONAL LABOR TRIBUNAL

"Industrial squabbles are the worst menace which this country faces to-day," said Henry J. Allen, governor of Kansas, in an address before the convention of the Audit Bureau of Circulations at Hotel La Salle, Chicago, on Oct. 28. "Kansas faced the same situation two years ago and met it successfully with an industrial tribunal for the settlement of disputes between capital and labor. Such a tribunal placed on the statute books of the nation to-day would bring industrial peace.

"We are paying too many men to-day to do one man's work," he said; "we have been bound too long by the radical in the labor group who is responsible for the theory under which labor works, namely, 'doing as little as you can for the most you can get.' That is the kind of radical leadership which has killed the goose that laid the golden egg."

In touching upon the advantages of a national industrial tribunal, he said: "We could then say to labor and to the employer, 'if you cannot settle your quarrels without bringing civil war on the helpless public, then this Government will do it for you'."

INTERNATIONAL NICKEL COMPANY REPORT

CONSOLIDATED GENERAL PROFIT & LOSS STATEMENT
SIX MONTHS ENDING SEPTEMBER 30, 1921

Earnings		$24,396.16
Other Income		192,740.71
Total Income		$217,136.87
Administration and Gen'l Expenses	$215,081.58	
Reserved for U. S. and Foreign Taxes	50,467.87	265,549.45
Net Income (Deficit)		$48,412.58
Depreciation and Mineral Exhaustion		380,396.98
Deficit		$428,809.56
Dividends		
Preferred No. 63 Paid Aug. 1, 1921	$133,689.00	
Preferred No. 64 Payable Nov. 1, 1921	133,689.00	267,378.00
Balance (Deficit)		$696,187.56

NEW YORK, NOVEMBER 7, 1921

BRONZE TURKEY FOR PRESIDENT HARDING

One of the first cabin passengers who arrived on the Italian liner Taormina from Genoa was Charles D. Malaguti, a leather merchant of Boston, who brought a bronze turkey, mounted on a marble pedestal, which he presented to President Harding in Washington on Thanksgiving Day, in behalf of the Italy-America Society of Italy.

The bronze is about eight inches high. It is the work of O. E. Sala, a sculptor well known in Italy.—N. Y. Times.

METAL YACHT ENDS 65,000 MILE JOURNEY

The Carnegie, a non-magnetic vessel, so constructed that there is practically no iron or steel aboard her, drydocked for repairs at Balboa, on the Panama Canal, October 7, 1921. She is being used by the Carnegie Institute of Washington to make a magnetic survey of the earth. The engine and stove in the galley are of brass and the anchors of bronze. This yacht was described and illustrated in a former issue of THE METAL INDUSTRY.

GOVERNMENT PUBLICATIONS

Artificial Gas and By-Products in 1917-18.—By R. S. McBride, U. S. Geological Survey, Washington, D. C.

Lead and Zinc 1921.—U. S. Geological Survey, Washington, D. C.

Zinc in 1920.—By C. E. Siebenthal and A. Stoll, U. S. Geological Survey, Washington, D. C.

Gold and Silver in 1919 (General Report).—By J. P. Dunlop, U. S. Geological Survey, Washington, D. C.

Abrasive Materials in 1920.—By L. M. Beach and A. T. Coons, U. S. Geological Survey, Washington, D. C.

Lime in 1920.—By G. F. Loughlin and A. T. Coons, U. S. Geological Survey, Washington, D. C.

Silica in 1920.—By L. M. Beach, U. S. Geological Survey, Washington, D. C.

Zinc in 1919.—By C. E. Siebenthal and A. Stoll, U. S Geological Survey, Washington, D. C.

Antimony in 1920.—By Frank C. Schrader, U. S. Geological Survey, Washington, D. C.

Sand and Gravel in 1920.—By L. M. Beach, U. S. Geological Survey, Washington, D. C.

TRADE PUBLICATIONS

Calendar.—Sent out by M. M. Mayer, now of 58 W. 10th street, to the plating and polishing trade.

Dixon Crucibles.—A circular issued by A. L. Haasis of the Joseph Dixon Crucible Company, Jersey City, N. J.

Research Narrative No. 20. Glassware and Warfare.—A folder issued by the Engineering Foundation, 29 West 39th street, New York.

Magno Ignition Metal.—A circular issued by the Electrical Alloy Company, Morristown, N. J., describing the merits of their special alloy for spark plugs.

Baird Automatic Machinery.—The October, 1921, issue of the Baird Machine Company's periodical circular describing the applications of their machines.

List of Designs.—Issued by the Sundh Engineering and Machine Company, 1105 Frankford avenue, Philadelphia, Pa., listing their various designs of rolling mill equipment.

Simpson Intensive Foundry Mixer.—Circular No. 70, issued by the National Engineering Company, 549 W. Washington Boulevard, Chicago, Ill., illustrating and describing various styles of the Simpson mixer for sand and other foundry materials.

The Course in Industrial Publishing.—A pamphlet issued by the New York Publishers Association, describing the course which they are conducting on this subject in cooperation with the Business Training Corporation, 185 Madison avenue, New York.

Costs in Your Brass Foundry.—A folder issued by the Electric Furnace Company, Alliance, Ohio, illustrating the Baily Electric Furnace in operation in plants throughout the United States and Canada.

Trasco Devices.—A catalogue issued by the Track Specialties Company, 29 Broadway, New York, describing and illustrating their various appliances for the maintenance of railroad and other tracks.

Making One-Piece Baffles.—A folder issued by the Quigley Furnace Specialties Company, containing a reprint of an article appearing in "Power" describing the building of boiler baffles with Hytempite cement.

Heat-Treatment of Springs with Stationary and Continuous Furnaces.—Bulletin No. 240, issued by the W. S. Rockwell

Company, 50 Church Street, New York City, illustrating and describing their conveyor furnaces for heat treating.

Calendar.—A neat little calendar is being circulated among their friends by the W. A. Fuller Company, Greensburg, Pa., manufacturers of the Natrolin metal cleaner.

Oakite.—A folder issued by the Oakley Chemical Company, 22 Thames street, New York, containing a price list, and selling and contract conditions applying to their Oakite cleaner.

Cleanliness Is Essential to Good Plating.—A catalogue issued by the Belke Tank Filter Company, Fisher Building, Chicago, Ill., describing and illustrating the Belke Perfect Tank Filter and its applications, and also Air Agitation of Solutions.

Magna.—Two folders issued by the Magna Metal Corporation, 709 Sixth avenue, New York, one setting forth the properties and uses of Magna metal, and the other containing an extract from a Bureau of Mines Report on magnesium and its alloys.

The Triplex No. 1 Machine Tool.—A folder issued by the Triplex Machine Tool Corporation, 18 East 41st street, New York, illustrating a new convertible machine tool, which can be used for turning, milling, thread-cutting and drilling, and is quickly turned from one to the other kind of work.

"American" Hand Propelled Sand Cutting Machine.—A folder issued by the American Foundry Equipment Company, 366 Madison avenue, New York, describing and illustrating their Type H, sand cutting machine, hand propelled, for use in small foundries and those having crowded floor space.

"Despatch-Universal" Electric Oven.—A folder issued by the Despatch Manufacturing Company, 120-122 First avenue North, Minneapolis, Minn., illustrating and describing their electric oven, which can be used for japan and enamel baking, mold and core baking, babbitting, plating, bronzing and lacquering.

Anaconda Copper Mining Company.—A circular issued by the Anaconda Copper Mining Company, 25 Broadway, New York, to their shareholders setting forth the reasons for and the general details of the transaction in which they are now engaged to acquire a large portion of the stock of the American Brass Company.

The Shipping Board and Our Merchant Marine.—A booklet issued and distributed by the Mechanics and Metals National Bank, New York, presenting an analysis of the situation now existing in the United States, wherein the Shipping Board constitutes an important factor in the economic situation of the country.

Eureka Spraying Equipment.—A catalogue issued by the Eureka Pneumatic Spray Company, Inc., 62-64 Ninth avenue, New York, describing and illustrating their line of air brushes and sprayers for paints, varnishes, lacquers and materials of a similar nature, as well as the necessary auxiliary equipment, including air compressors and tanks, spraying booths with exhaust systems, and minor accessories.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	$100	$375	$425
American Brass	100	283	288
American Hardware Corp	100	150	155
Bristol Brass	25	15	..
International Nickel, com	25	12	12¼
International Nickel, pfd	100	59¾	65
International Silver, com	100	25	35
International Silver, pfd	100	88	92
New Jersey Zinc	100	124	126
Rome Brass & Copper	100	125	..
Scoville Mfg. Co	100	370	390
Yale & Towne Mfg. Co	..	270	280

Corrected by J. K. Rice, Jr., & Co., 36 Wall Street, New York.

Metal Market Review

Written for The Metal Industry by W. T. Partridge.

In the general financial and commercial situation which threatened world trade disaster during 1921, developments in the necessary readjustments to changed conditions following the war, had carried safely past the most menacing difficulties, at the close of the year. While all problems had not yet been satisfactorily solved, sufficient progress had been made to relieve the previously existing strain and uncertainty, and to make apparent the distinctly improved and encouraging features which indicate more prosperous, and better conditions in nearly all lines of business in 1922.

Reviewing the real status of the nation's foreign trade, about which such discouraging things have been said, it becomes clearly evident that lower prices of merchandise, rather than diminished quantities were largely responsible for the decline in valuation of approximately six billion dollars on the estimated value of our total foreign trade, $7,500,000,000 in 1921, as compared with the 1920 total valuation of $13,500,000,000.

The trade balance in favor of the United States at the end of 1921 is estimated—total official figures are not yet available—to be about $2,019,000,000 as compared with the 1920 favorable balance of nearly $3,000,000,000.

Among the disorganizing and confusing factors carried over into first half of 1921, from the critical depression of last quarter of 1920 was the "panic of cancellations of contracts" which occurred in greater volume than ever before experienced in our trade relations. The unparalleled exchange situation by which the purchasing power of all monetary values in Europe was greatly reduced, resulted in a revival of competition in European markets with a consequent drastic reduction in demand for American raw products. While the cancellations of contracts practically had ceased by the middle of the year, the exchange problem is still with us, notwithstanding the recovery in sterling, to the highest level around $4.20 from the lowest level $3.18 during the year. The mark, the lire and the franc also have made some recovery, but until stabilization of currencies is established, on an approximately more permanent basis, conditions in trade will remain unsatisfactory.

The outlook for 1922 in metals is encouraging, although prices and the volume of business transacted are not yet completely stabilized. Business cannot become entirely adjusted until world conditions are more settled, particularly in regard to transportation rates, taxes, credits, foreign exchanges and the almost universal labor problem. Progress has been made, however, in these matters, which it is hoped will lead to favorable settlement for each one. On the whole, there is reason for greater optimism than at the end of 1920, but irregularities in both prices and demand are likely to continue for some time to come.

COPPER

Refined output of copper during 1921, according to trade estimates, was approximately one billion pounds, while sales on both domestic and foreign account are estimated 1,150,000,000 pounds. Deliveries into consumption were 350,000,000 pounds of which 780,000,000 were to domestic consumers, indicating an average monthly domestic consumption of 65,000,000 pounds. Total exports—estimating the December outgo 60,000,000 pounds—were approximately 570,000,000 pounds. Figures used in making these estimates are those furnished by the Government from month to month and include a considerable amount of manufactured copper; therefore these estimates are in excess of exports recognized by the Copper Export Association. Basing estimates upon the Copper Export Association figures, rather than upon Government returns, stocks of refined copper at the end of 1921 were about 442,000,000 pounds, of which 300,000,000 pounds remain from the amount put aside for export early in 1921, leaving 142,000,000 pounds available for domestic consumption. Blister copper at plants and in course of refining are estimated about 245,000,000 lbs. making total refined and blister copper available about 687,000,000 pounds. Current smelter production plus imports into this country, gives a monthly supply of about 60,000,000 pounds and this being

5,000,000 pounds less than average monthly consumption, indicates there is no necessity for resumption of operations at mines for several months, if not for a longer time. Demand for copper in the last quarter of 1921 was equal to total demand during entire first six months period of the year. The statistical position of copper is very encouraging and the commercial position is steadily improving.

During first quarter, the highest prices were lake, 14c. a lb. in January, electrolytic 13½c. in February and casting 12¾c. in January; the lowest levels during this period were in March, lake 12¼c., electrolytic 12c. and casting 11½c. During second quarter, the highest levels were lake 13¼c. in May and June, electrolytic 13⅛c. in May and June and casting 12⅝c. in May. In the summer quarter, the lowest levels of the year were in August, lake 12c., electrolytic 11½c. and casting 11¼c., while the highest levels of this period were in September, lake 12½c., electrolytic 12¼c. and casting 12c. a pound. In the last quarter there was complete recovery to the high levels prevailing in January, outside prices being lake 13⅞c. delivered, electrolytic 13¾c. f. o. b. refinery and casting 13c. f. o. b. refinery a lb. for prompt and first quarter 1922. Producers were obtaining 13⅞c. to 14c. for prompt and January delivered, and 14c. for first quarter 1922.

TIN

Artificial conditions and prices prevailing in the tin market, in 1920, largely due to tardy relinquishment of Government control established as a wartime emergency, carried over into 1921 were bound to collapse in the necessary readjustment. By end of first quarter, prices had declined from the highest level 39c. January 11, to 29c., the lowest level of the period being 27.50c. for spot Straits on March 9. The feature of the quarter was absence of demand from American consumers, consumption being the smallest in twenty years. Prices of American pure ranged ¼c. to ¾c. a pound under Straits prices and 99% metal averaged about 4c. a pound less than Straits. Second quarter conditions were very discouraging, American stocks while heavy, were strongly held. Active speculation in London carried prices, there, upward but the trend here was to lower levels. Late in June deliveries into consumption were slightly increased. The highest prices of the period was 33.50c. in May for spot Straits, while the lowest level of the quarter was 23.87½c. at the end of June. The lowest levels of the year came in the third quarter when Straits sold, in August, at 25.50c., due to the greater competition for whatever orders were placed, demand for small quantities being more frequent. September deliveries, as a result, just about equalled importations, the first time this had happened in the year. In the last quarter, there no longer remained any doubt as to the general business improvement that was progressing slowly in many lines, particularly in most of the non-ferrous metals. The statistical position of tin was slightly better and prices naturally were higher because of the rise in sterling exchange. The lowest level in last quarter was 26c. in September and the highest 33.75c. in December, the closing price, 33.12½c. showed a net decline of but 1⅞c. a pound. Deliveries into domestic consumption in 1921 were about 26,000 tons as compared with 51,120 tons for 1920.

ZINC

Production of zinc in 1921, according to preliminary report of U. S. Geological Survey, was reducer 60 per cent. as compared with 1920 output—the total being 250,000 tons as compared with 584,772 tons in 1920. Heavy surplus stocks were carried over from 1920 making the drastic reduction necessary for stabilization of the industry. Stocks at the end of November, 1921, were 74,000 tons as compared with 94,747 tons, June 30, 1921, and with 71,037 tons at the end of 1920. Thus it is evident that surplus is still menacing, although, consumption has improved. Apparent consumption in 1921 was about 196,000 tons as compared with 323,044 tons in 1920. Exports in 1921 were the lowest on record in ten years, the outgo being only 4,460 tons. A feature most unusual, was the anomalous condition of world markets in the last four months of 1920, which carried over into first quarter 1921, permitting the resale in the U. S. of domestic zinc which previously had been exported to Europe. The total quantity returned to this country was 8,893 tons, of which 8,162 tons came back in 1920 and 731 tons returned in 1921.

Prices of primary spelter fluctuated between the lowest, 4.12½-4.62½c. established in August, and the highest 5.60-6.10c. in January, East St. Louis, and New York respectively; covering a range of fractionally a little more than 1¼c. a pound, the lowest level being a new minimum record for the sale of zinc. Sheet zinc, which opened 11.50c. a pound, closed 8.50c., a net decline of 3c. a pound. Brass special, opening 5.75c. closed 4.85c. The net result on primary, was a decline of 90 points New York, and 75 East St. Louis.

LEAD

Production of lead in 1921, according to Geological Survey preliminary report, was 440,000 tons as compared with 529,657 tons in 1920. Of this amount, 390,000 were from domestic ores and about 50,000 tons from foreign material. Exports were about 33,700 tons of which 33,000 tons were from foreign ores and 700 tons were from domestic material. Importations of refined lead were about 32,000 tons as compared with 35,719 tons in 1920. Demand for lead in 1921, was not only in larger volume, proportionately, than for any other non-ferrous metal, but was steadier, any slight falling off being toward the close of the year. Pigment interests were the main support of the market, early in the year, but cable and electrical interests were large buyers later, demand being well distributed over the entire country. Desilverized lead producers had the Eastern markets largely to themselves, until lower freight rates, late in the fall, enabled soft Missouri metal producers to compete. The New York position was almost constantly stronger than the East St. Louis position because of the smaller stocks available here, and the larger volume of demand in the Eastern territory. Mexican lead, because of higher prices obtainable in European markets was attracted away from this country.

Price fluctuations in both the outside market and producers' basis, were narrow, the leading interest making a net decline of but 5 points. Total fluctuations were between the lowest, 4.00c. in February and March, and its highest 5.00c. in May and June, while the opening was 4.75c. and the closing 4.70c. a pound. Total fluctuations in the outside market were between the lowest, 3.90-4.00c. in February and March and the highest 5.05-5.30c. in May; East St. Louis, and New York respectively. The opening was 4.65-4.70c. East St. Louis, and New York respectively, and the closing 4.40-4.45c. Western and Eastern respectively.

ANTIMONY

The antimony story of 1921, briefly told, is: excessively large supplies, light demand and new record low prices. At the end of October—the latest returns available—importations during the ten months inclusive were 8,895 tons as compared with 10,741 tons received in the corresponding period of 1920. Stocks in bonded warehouses, Oct. 31, 1921, were 1,386 tons as compared with 1,561 tons, Oct. 31, 1920. Prices fluctuated between the lowest, 4.50c. a pound, duty paid for wholesale, established in August and reached again in December, and the highest level 6.00c. in March, covering a range of 1.50c. a pound. The opening was 5.25c. duty paid and the closing 4.50c. a pound, making a net decline of ¾c. a pound.

ALUMINUM

Aluminum in 1921, after experiencing a short revival in demand early in the year—from the stagnation existing at the end of 1920—and which carried prices to the highest level, 26c. during February for 98-99% virgin ingots, then suffered heavily from lack of buying interest, which again resulted in almost complete stagnation before the close of 1921. The continued influx of foreign aluminum freely offered at attractive concessions for deliveries over the entire year, made it practically impossible for recovery in outside process, which reached the lowest levels 17c. for virgin 98-99%; 16c. for 98-99% remelted and 14c. for No. 12 remelted in October, this level remaining unchanged over the remainder of the year. Another factor of considerable importance in restricting business, was the high freight rates for shipments from the West which rendered active competition unprofitable. Outside market prices at the beginning of 1921 were 22-23c. for 98-99% virgin, 21-22c. for 98-99% remelted and 20-21c. for No. 12 remelted, as compared with the lowest levels prevailing from October to the end of the year, 17-18c. for 98-99% virgin, 16-17c. for 98-99% remelted

and 14-15c. for No. 12 remelted, and which made the net decline 5c. a pound each, on 98-99% virgin and 98-99% remelted, and 6c. a pound on No. 12 remelted. The Aluminum Company of America, it was generally understood, during the year were making average deliveries on contracts with regular consumers. Price changes in its schedule were made from time to time, which reached the lowest levels in December, when 99% and purer was 20c.,98-99% virgin, 19c., No. 12 alloy 19c., and sheets 18ga and heavier 35c. for flat, as compared with prices at the beginning of the year, 98-99% virgin, 28.30c., No. 12 alloy 27.50c. and sheet 18ga. and heavier 42.60c. all in 15-ton lots, f. o. b. producers' plant, making a net decline of 9.30c. on 98-99% virgin, 8.50c. on No. 12 alloy and 7.60c. on sheet 18ga. and heavier.

Importations of aluminum during first ten months 1921—later returns are not yet available—were 11,836 tons as compared with 15,388 tons in the corresponding 1920 period. Stocks in bonded warehouses October 31, 1921 were 1,230 tons. Exports during first ten months 1921 were 904 tons as compared with 3,819 tons in the corresponding period 1920.

SILVER

World production of silver in 1921 according to trade estimate, was approximately 150 million ounces, the lowest in thirty years. World consumption about 360 million ounces. United States production was 42 million ounces, as compared with 55 million ounces in 1920. The reduction in United States output was largely due to curtailed operations in copper. Copper companies in 1920 contributed 25 per cent. of our total output. Exports during first eleven months inclusive, 1921 were $44,430,452, while exports during the same period 1920 were $107,535,304. Importations during first eleven months inclusive were $57,726,767 as compared with $83,434,399 during the same period in 1920. Thus, importations in the 1921 eleven months were $12,296,315 in excess of exports while in the 1920 eleven months, the reverse was true, with exports $24,100,905 in excess of imports. The price of domestic silver bars throughout the year was pegged by the Pittman act around $1 per ounce, fractional fluctuations being due to freight rates. Prices of foreign bars were established by London, the highest being 73⅝c. in October, the lowest 52⅝c. in March. The opening was 65¾c., the closing 64⅝c.

QUICKSILVER

Production of quicksilver in this country, according to trade estimates has fallen to the equivalent of about 20,000 flasks of 75 lbs. each, per annum, while total world output in 1921 was estimated at not more than the equivalent of 95,000 flasks, the lowest output in many years. Demand, also, in 1921 was greatly reduced and prices after the opening, $48 a flask, fluctuated between the lowest $38 in October—when the tide turned—and the highest $52 in December, closing $51, with a net advance for the year of $6 per flask. The better prices, were largely due to diminished supplies rather than to greatly increased demand, although there was some improvement also, in demand.

PLATINUM

Production in first nine months of 1921, was estimated 43,325 ounces, of which total, 22,538 ounces were attributed to Colombia and 20,787 ounces to other countries. In this country jewelry absorbs 60% of U. S. consumption. Prices in 1921 opened $75 per ounce for pure, reached the lowest, $65 in July, and by the end of December had recovered to $84, making a net advance of $9 per ounce.

OLD METALS

The year 1921 in old metals ended with as much optimism in the trade as there was pessimism at the close of 1920, when each dealer was making his own prices, according to individual viewpoint regarding each sale. Coppers during December reached the highest levels of the year, advancing in that month ½c. on light copper to 9c., ¼c. on uncrucibled to 11c. and 1c. on strictly crucibled to 11½c. Advances of ¼c. each were made on heavy lead to 4c. and on battery lead to 2¼c. Block tin pipe was up 3½c. to 26½c., pure tin foil 2c. to 17c. and No. 1 pewter 1c. to 17c. Aluminums were down, clippings ½c. to 12c., old sheet ½c. to 9c., and old cast ¾c. to 9c. Cocks and faucets and clean red car boxes were unchanged, each 6½c., electrotype 3¾c., stereotype 4¼c., also their drosses, the former 1¾c. and the latter 2c. a pound.

DECEMBER MOVEMENT IN METALS

	Highest	Lowest	Average
Copper:			
Lake	13.87½	13.50	13.804
Electrolytic	13.75	13.50	13.667
Casting	13.00	12.87½	12.97
Tin	30.75	30.37½	32.488
Lead	4.45	4.35	4.395
Zinc (brass special)	5.00	4.80	4.944
Antimony	4.55	4.50	4.509
Aluminum	18.00	17.00	17.50
Quicksilver (per flask)	51.00	48.00	49.452
Silver (cts. per oz.) foreign	68	63¼	65.76

WATERBURY AVERAGE

Lake Copper.—Average for 1920, 18.06—January, 1921, 13.75—February, 13.50—March, 12.625—April, 12.75—May, June, 5.00—July, 4.80—August, 4.70—September, 4.75—October, 12.375—October, 13.125—November, 13.375—December, 13.875..

Brass Mill Zinc.—Average for 1920, 8.33—January, 1921, 6.05—February, 5.50—March, 5.25—April, 5.20—May, 5.30—June, 5.00—July, 4.80—August, 4.70—September, 4.75—October, 5.10—November, 5.15—December, 5.30.

Metal Prices, January 9, 1922

NEW METALS

Open Market

	Cents
COPPER—DUTY FREE. PLATE, BAR, INGOT AND OLD COPPER.	
Manufactured 6 per centum.	
Electrolytic, carload lots, delivered	13⅞-14c.
Lake, carload lots, delivered	13¾-14c.
Casting, carload lots, delivered	13⅛c.
TIN—Duty free.	
Straits, carload lots	32.25
LEAD—Duty, Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig, carload lots	4.75-4.80
ZINC—Duty 15%.	
Brass Special	5.25-5.30
Prime, Western, carload lots	5.15-5.20
ALUMINUM—Duty, Crude, 2c. per lb. Bales, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	.....
100-lb. f. o. b. factory	.....
Ton lots, f. o. b. factory	17-20.10
ANTIMONY—Duty 10%.	
Cookson's Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	4.50
NICKEL—Duty, Ingot, 10% ad valorem. Sheet, strip, strip and wire, 20%.	
Ingot	41.00
Shot	41.00
Electrolytic	33-44
MANGANESE METAL—95-98% Mn., carbon free, per lb. Mn. contained. Nominal	0.75
MAGNESIUM METAL—Duty 20% ad valorem (100 lb. lots)	$1.25-1.35
BISMUTH—Duty free	1.80
CADMIUM—Duty free	1.00-1.25
CHROMIUM METAL—95-98% Cr., per lb. Cr. contained. Nominal	1.50
COBALT—97% pure	3.00-3.25
QUICKSILVER—Duty 10% per flask of 75 lbs	$50
PLATINUM—Duty free, per ounce	$84
SILVER—Government assay—Duty free, per ounce	.99⅝
GOLD—Duty free, per ounce	20.67

Metal Prices, January 9, 1922

INGOT METALS

Silicon Copper, 10%	according	to	quantity	34 to38
Phosphor Copper, guaranteed 15%	"	"	"	19 to29
Phosphor Copper, guaranteed 10%	"	"	"	18½to28½
Manganese Copper, 30%	"	"	"	50 to56
Phosphor Tin, guarantee 5%	"	"	"	35⅝to45⅝
Phosphor Tin, no guarantee	"	"	"	41¾to51
Brass Ingot, Yellow	"	"	"	8¾to12
Brass Ingots, Red	"	"	"	13½to15
Bronze Ingot	"	"	"	12 to14½
Parsons Manganese Bronze Ingots	"	"	"	16½to18
Manganese Bronze Castings	"	"	"	24 to33
Manganese Bronze Ingots	"	"	"	13 to16
Manganese Bronze Forgings	"	"	"	30 to40
Phosphor Bronze	"	"	"	24 to30
Casting Aluminum Alloys	"	"	"	18 to21
Monel Metal	"	"	"	38

OLD METALS

Buying Prices		Selling Prices
10¼to10¾	Heavy Cut Copper	11¾to12
10 to10½	Copper Wire	11½to11¾
8½to 9	Light Copper	10 to10½
9 to 9½	Heavy Machine Comp	11 to11½
6½to 7	Heavy Brass	8 to 8½
5 to 5½	Light Brass	6½to 7
5½to 6	No. 1 Yellow Brass Turnings	6½to 7
7½to 8	No. 1 Comp. Turnings	9 to 9½
4	Heavy Lead	4½
4	Zinc Scrap	4½
5 to 5½	Scrap Aluminum, Turnings	7 to 8
10½to11½	Scrap Aluminum, cast alloyed	12½to13½
13½to14½	Scrap Aluminum, sheet (new)	15½to16½
18½	No. 1 Pewter	22½
15	Old Nickel anodes	17
23 to25	Old Nickel	27 to29

BRASS MATERIAL—MILL SHIPMENTS

In effect Dec. 1, 1921

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.16¾	$0.18¼	$0.19¾
Wire	0.17¼	0.18¾	0.20¼
Rod	0.14¾	0.19¼	0.20¾
Brazed tubing	0.25½	....	0.30½
Open seam tubing	0.25½	....	0.30½
Angles and cannels	0.30½	....	0.35½

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	$0.17¾	$0.19¼	$0.20¾
Wire	0.18¼	0.19¾	0.21¼
Rod	0.15¾	0.20¼	0.21¾
Brazed tubing	0.26½	....	0.31½
Open seam tubing	0.26½	....	0.31½
Angles and channels	0.31½	....	0.36½

SEAMLESS TUBING

Brass, 18½c. to 19½c. per lb. base.
Copper, 21¼c. to 22¼c. per lb. base.

TOBIN BRONZE AND MUNTZ METAL

Tobin, Bronze Rod	18¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	16¾c. " "
Muntz or Yellow Rectangular Sheets other than Sheathing	17¾c. " "
Muntz or Yellow Metal Rod	14¾c. " "

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	21¼c.-22¼c. net base
From stock	22¼c.-26¼c. net base

BARE COPPER WIRE—CARLOAD LOTS

15¼c. to 15½c. per lb. base.

SOLDERING COPPERS

300 lbs. and over in one order	19¼c. per lb. base
100 lbs. to 300 lbs. in one order	19¾c. per lb. base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 8½c., basis less 8 per cent. discount.

Casks, jobbers' prices	9½c. to 10c.
Open casks, jobbers' prices	10½c. to 11½c.

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	35c.
Aluminum coils, 24 ga. and heavier, base price	30c.

NICKEL SILVER (NICKELENE)

Base Prices

Grade "A" Nickel Silver Sheet Metal

10% Quality	26¼c. per lb.
15% "	28¾c. " "
18% "	29½c. " "

Nickel Silver Wire and Rod

10% Quality	28c. per lb.
15% "	32¼c. " "
18% "	35c. " "

MONEL METAL

Shot	35
Blocks	35
Sheet Bars	40
Hot Rolled Rods (base)	42
Cold Drawn Rods (base)	56
Hot Rolled Sheets (base)	55

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. or more, 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25s. over. Above prices f. o. b. mill.

Lead Foil—base price—figured on base price of lead at the time.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturer.

SILVER SHEET

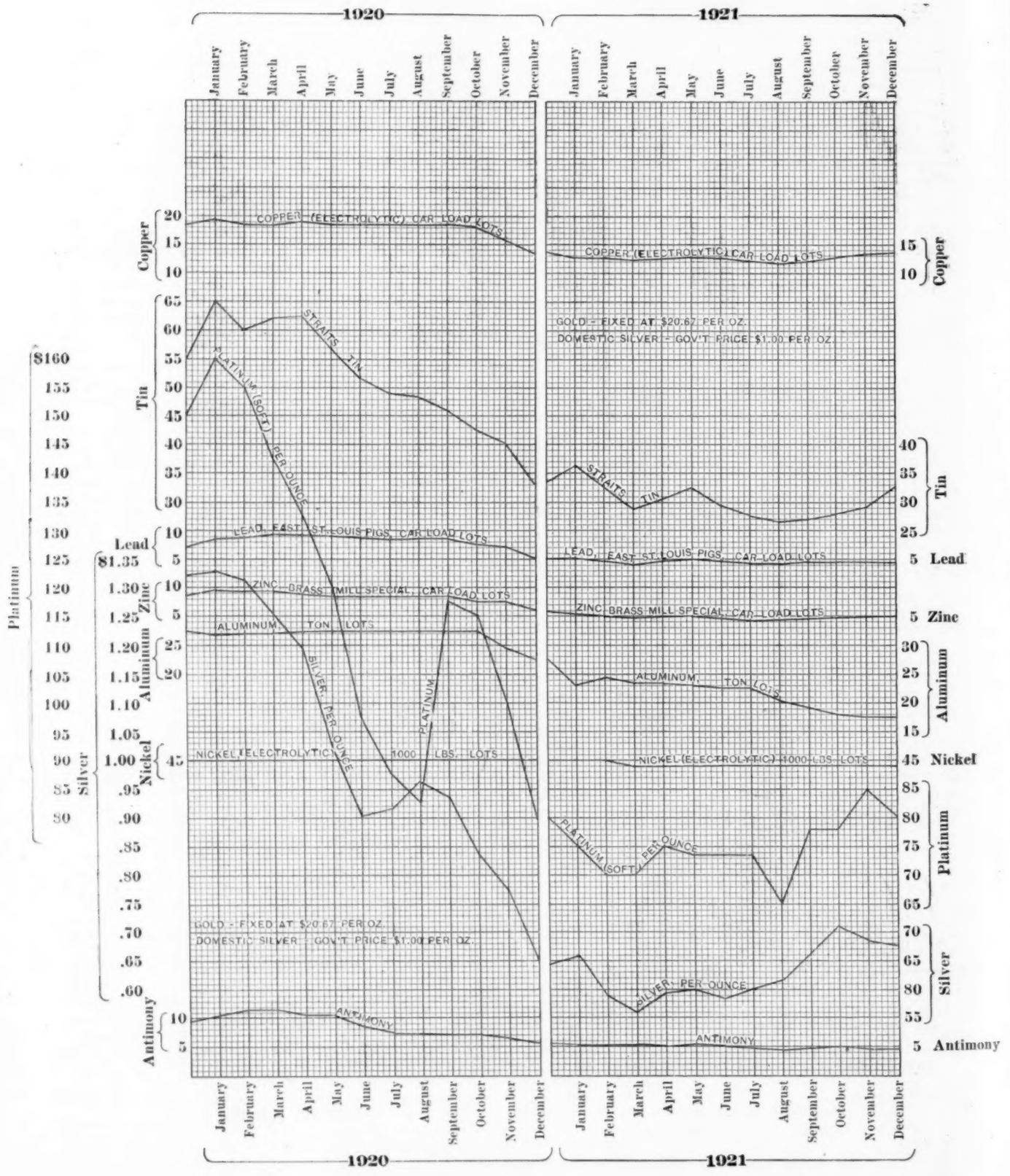
Rolled silver anodes .999 fine are quoted at from 68½c. to 71c. per Troy ounce, depending upon quantity.

Rolled sterling silver, 65½c. to 68c.

NICKEL ANODES

85 to 87% purity	.40c. per lb.
90 to 92% "	.42½c. per lb.
95 to 97% "	.45c. per lb.

CHART OF METAL PRICES FOR 1920-1921



Pig Iron and Metal Products of the United States

Calendar Years 1912-1920. (1921 Estimated.)

(FROM THE UNITED STATES GEOLOGICAL SURVEY.)

PRODUCTS METALLIC	1912 Quantity	1912 Value	1913 Quantity	1913 Value	1914 Quantity	1914 Value	Products
Pig iron (spot value), long tons	30,180,969	$420,563,388	30,388,935	$458,342,345	22,263,263	$298,777,429	Pig iron
Silver, commercial value, troy ounces	63,766,800	39,197,500	66,801,500	40,348,100	72,455,100	40,067,700	Silver
Gold, coining value, troy ounces	4,520,717	93,451,500	4,299,783	88,884,400	4,572,976	94,531,800	Gold
Copper, value at New York, pounds	1,243,268,720	205,139,338	1,224,484,098	189,795,035	1,150,137,192	152,968,000	Copper
Lead, value at New York, short tons	392,517	35,326,530	411,878	36,245,264	512,794	39,998,000	Lead
Zinc, value at St. Louis, short tons	323,907	44,699,166	337,252	37,772,224	343,418	35,029,000	Zinc
Quicksilver, value at S. Francisco, flasks	25,064	1,053,941	20,213	813,171	16,548	811,680	Quicksilver
Aluminum, pounds	*	7,400,000	*	9,450,000	*	10,080,000	Aluminum
Antimonial lead, short tons	13,552	1,311,348	16,665	1,591,854	16,667	1,572,167	Antim. L'd
Nickel, value at New York, sh. tons	328	93,600	241	79,393	423	313,000	Nickel
Tin, pounds	.....	124,800	.....	46,699	208,000	66,560	Tin
Platinum, value at New York City, troy ounces	1,005	45,778	1,034	46,530	6,324	280,885	Platinum
Total value of metallic products (approximate) (b)	.....	$862,608,000	.....	$878,869,000	.....	$686,639,000	

PRODUCTS METALLIC	1915 Quantity	1915 Value	1916 Quantity	1916 Value	1917 Quantity	1917 Value	Products
Pig iron (spot value), long tons	30,384,486	$401,409,604	39,126,324	$663,478,118	38,612,546	$1,053,785,975	Pig iron
Silver, commercial value, troy ounces	74,961,075	37,397,300	74,414,802	48,953,000	71,740,362	59,078,100	Silver
Gold, coining value, troy ounces	4,887,602	101,035,700	4,479,056	92,590,300	4,051,440	83,750,700	Gold
Copper, value at New York, pounds	1,388,009,527	242,902,000	1,927,850,548	474,288,000	1,886,120,721	514,911,000	Copper
Lead, value at New York, short tons	507,026	47,660,000	552,228	76,207,000	548,450	94,333,000	Lead
Zinc, value at St. Louis, short tons	458,135	113,617,000	564,338	151,243,000	584,597	119,258,000	Zinc
Quicksilver, value at S. Francisco, flasks	21,033	1,804,631	29,932	3,768,139	36,159	3,808,266	Quicksilver
Aluminum, pounds	*	16,280,000	*	33,900,000	*	45,882,000	Aluminum
Antimonial lead, short tons	23,224	3,665,736	24,038	4,483,582	18,646	3,781,560	Antim. Lead
Nickel, value at New York sh. tons	822	538,222	918	671,192	402	331,556	Nickel
Tin, pounds	204,000	78,846	280,000	122,000	220,000	135,600	Tin
Platinum and allied metals, value at New York City, troy ounces	8,665	478,688	28,088	2,301,762	38,831	4,023,757	Platinum
Total value of metallic products (approximate) (b)	.....	$991,730,000	.....	$1,620,745,000	.....	$2,086,234,000	

PRODUCTS METALLIC	1918 Quantity	1918 Value	1919 Quantity	1919 Value	1920 Quantity	1920 Value	Products
Pig iron (spot value), long tons	38,230,440	$1,180,759,565	30,130,231	$775,915,043	35,710,227	$1,140,904,096	Pig iron
Silver, commercial, value, troy ounces	67,810,139	66,485,129	56,682,445	63,533,652	55,361,573	60,801,955	Silver
Gold, coining value, troy ounces	3,320,784	68,646,700	2,918,628	60,333,400	2,476,166	51,186,900	Gold
Copper, sales value, pounds	1,908,533,595	471,408,000	1,286,419,329	239,274,000	1,209,061,040	222,467,000	Copper
Lead, value at New York, short tons	539,905	76,667,000	424,433	44,990,000	476,849	76,296,000	Lead
Zinc, sales value, short tons	492,405	89,618,000	452,272	66,032,000	450,045	72,907,000	Zinc
Quicksilver, value at S. Francisco, flasks	32,883	3,863,752	21,415	1,933,560	13,392	1,066,807	Quicksilver
Aluminum, pounds	*	41,159,000	*	38,558,000	*	41,375,000	Aluminum
Antimonial lead, short tons	18,570	2,826,350	13,874	1,513,968	12,535	1,963,255	Antim. L'd
Nickel, value at New York, short tons	441	401,000	511	434,485	365	293,250	Nickel
Tin, pounds	138,000	118,500	120,000	78,600	40,000	20,100	Tin
Platinum and allied metals, value at New York City, troy ounces	59,753	6,517,980	45,109	5,614,335	41,544	4,697,722	Platinum
Total value of metallic products (approximate) (b)	.....	$2,153,318,000	.....	$1,351,600,000	.....	$1,724,300,000	

PRODUCTS METALLIC	1921 ESTIMATED† Quantity	Value Total	Value Per Unit
Pig iron, long tons (a)	16,543,686	(i)	(i)
Copper, pounds	507,000,000	$62,385,140	12.502c
Gold, ounces, fine	2,375,479	49,105,500	$20.67
Antimonial lead, short tons	5,419	(i)	(i)
Lead, short tons	406,910	36,955,395	4.545c
Zinc, short tons	(i)	(i)	4.655c
Quicksilver, flasks	6,000	272,772	$45.462
Silver, ounces, fine	50,364,389	50,364,389	$1.00
Tin, short tons	(i)	(i)	.30c

(i) Figures not available.
(†) Figures from Engineering and Mining Journal.
(b) Includes some items of minor interest to metal trades not shown in table.
(a) From The Iron Age.
(*) Survey not at liberty to publish figures.

Supply Prices, January 9, 1922

CHEMICALS

In Commercial Quantities—New York Prices

Acid—		
Boric (Boracic) Crystals	lb.	.14
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	**lb.**	**.02½**
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	**lb.**	**.08**
Nitric, 36 deg. Carboys	lb.	.07
Nitric, 42 deg. Carboys	lb.	.07¼
Sulphuric, 66 deg., Carboys	lb.	.02½
Alcohol—		
Denatured in bbls.	gal.	.47-.50
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.05
Aluminum sulphate, commercial tech	lb.	.02½-.03
Aluminum chloride solution	lb.	.20
Ammonium—		
Sulphate, tech., Barrels	**lb.**	**.04**
Sulphocyanide	lb.	.50
Argols, white, see Cream of Tartar	lb.	.29
Arsenic, white, Kegs	lb.	.06½
Asphaltum	lb.	.35
Benzol, pure	gal.	.45
Blue Vitrol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.05½
Calcium Carbonate (Prescipitated Chalk)	lb.	.05
Carbon Bisulphide, Drums	lb.	.07½
Chrome Green	lb.	37-42
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.48
Carbonate, Barrels	lb.	.19
Cyanide	lb.	.58
Sulphate, Barrels	lb.	.05¾
Copperas (Iron Sulphate, bbl.)	lb.	.02½
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.28
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton.	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	3.25
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.30
Shellac	lb.	—
Iron, Sulphate, see Copperas, bbl.	lb.	.02½
Lead Acetate (Sugar of Lead)	lb.	.12-.13
Yellow Oxide (Litharge)	**lb.**	**.09**
Mercury Bichloride (Corrosive Sublimate)	lb.	.68
Nickel—		
Carbonate Dry	lb.	.50-.55
Chloride, 100 lb. lots	lb.	.30-.40
Salts, single, bbls	lb.	.11
Salts, double, bbl.	lb.	.11
Paraffin	lb.	.07-.10
Phosphorus—Duty free, according to quantity		.25-.30
Potash, Caustic, Electrolytic 88-92% fused, drums	lb.	6½
Electrolytic, 70-75% fused	**lb.**	**.10**
Potassium Bichromate, casks	lb.	.11
Carbonate, 80-85%, casks	**lb.**	**.07**
Cyanide, 165 lb. cases, 94-96%	lb.	.42½
Pumice, ground, bbls	lb.	.04
Quartz, powdered	ton.	$30.00
Official	oz.	—
Rosin, bbls.	**lb.**	**.03½**
Rouge, nickel, 100 lb. lots	lb.	.20
Silver and Gold	lb.	.60
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.07½
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.45
Soda Ash, 58%, bbls	**lb.**	**.03**
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.05½
Bisulphate, tech., bbls	lb.	.03½
Cyanide, 96 to 98%, 100 lbs	lb.	.30
Hydrate (Caustic Soda) bbls	lb.	.04½
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	**lb.**	**.04½**
Phosphate, tech., bbls	lb.	.06
Silicate (Water Glass) bbls	lb.	.03
Sulpho Cyanide	lb.	.60
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.12-.13
Sulphur (Brimstone) bbls	**lb.**	**.03**
Tin Chloride	lb.	.33
Tripoli	lb.	.03½
Verdigris, see Copper Acetate	lb.	.48
Water Glass, see Sodium Silicate, bbls	lb.	.03
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.21
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls	lb.	.14-.18
Chloride, 600 lb. lots	lb.	.07½
Cyanide	lb.	.42
Sulphate, bbls.	**lb.**	**.03½**

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	$33.80
14 " 20 " 64/68, "	"	42.05
12 " 20 " 84/92, "	"	42.55
14 " 20 " 84/92, "	"	57.35
Sewed Buffs, per pound		
Bleached and unbleached	"	.50

FELT WHEELS

			Price Per Lb. Less Than 100 Lbs.	100 to 300 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"		2.50	2.40	2.25
" 6", 8" and over 16"	1" to 3"		2.60	2.50	2.35
" 6" to 24"	Over 3"		2.90	2.80	2.65
" 6" to 24"	½" to 1"		3.50	3.40	3.25
" 4" to 6"	**¼" to 3"**	}	4.50	Any quantity	
" Under 4"	¼" to 3"	}	5.10		

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes 50c advance.